

IS SAMSUNG'S GS 4 MORE
OF THE SAME?

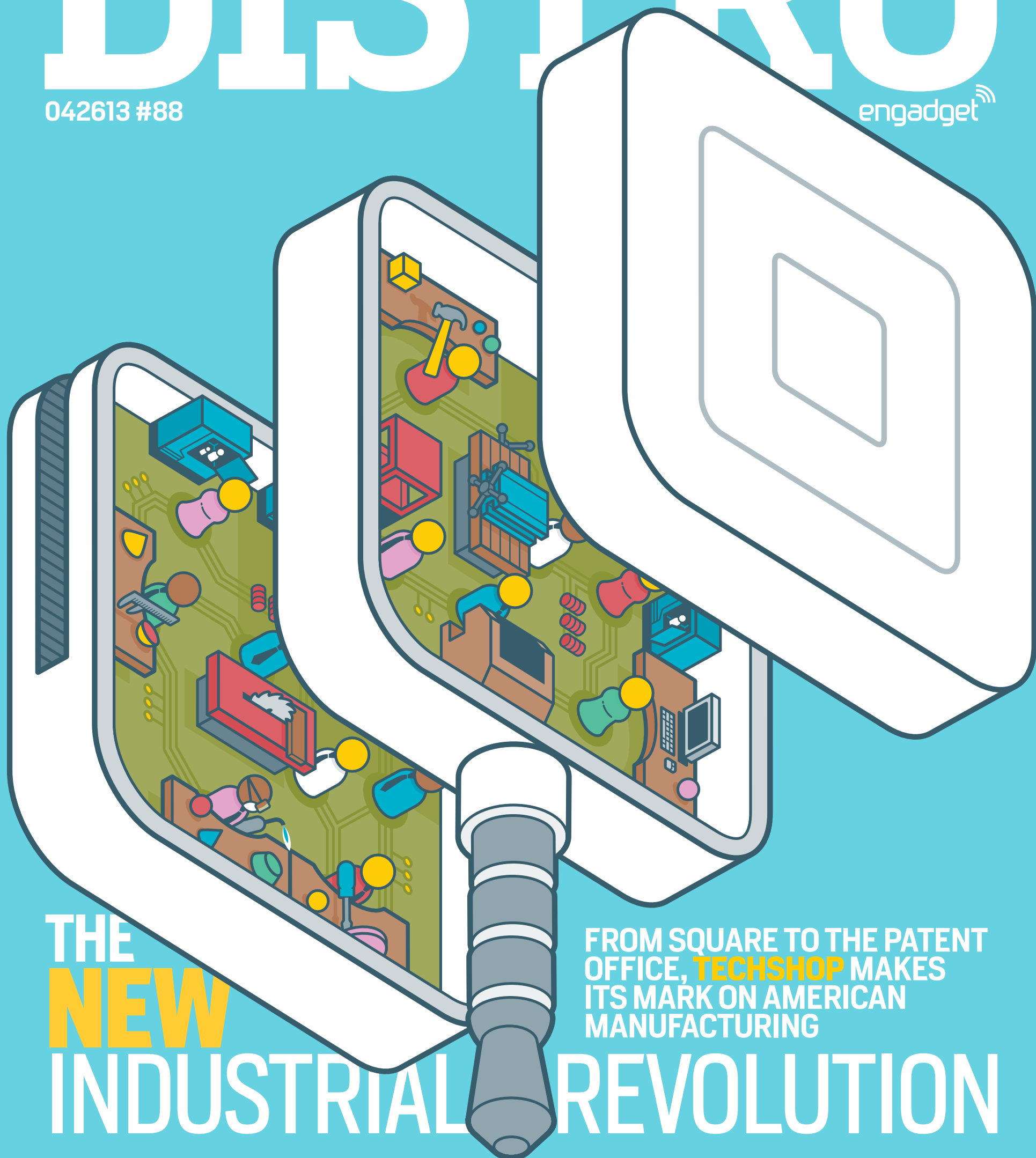
ASUS' CUBE RESHAPES
THE SET-TOP BOX

PLUS: Q&A WITH OCULUS
FOUNDER PALMER LUCKEY

DISTRO

042613 #88

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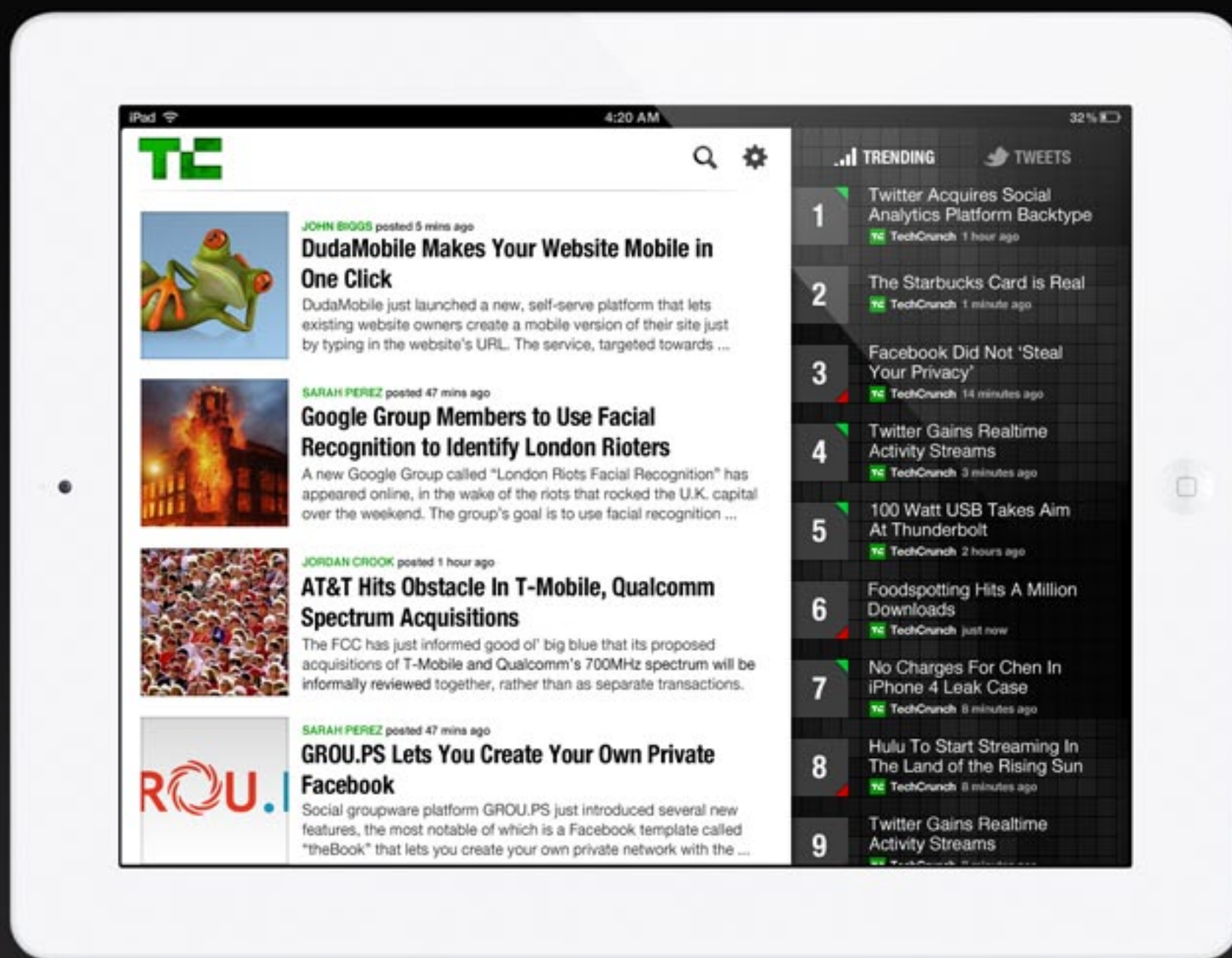
THE
NEW
INDUSTRIAL REVOLUTION

FROM SQUARE TO THE PATENT
OFFICE, **TECHSHOP** MAKES
ITS MARK ON AMERICAN
MANUFACTURING



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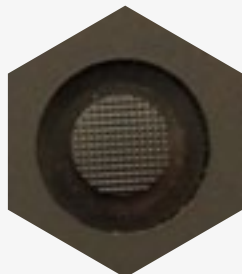
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By Tim Stevens

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INBOX
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CLASSIC
EDITION**
Palm Pre



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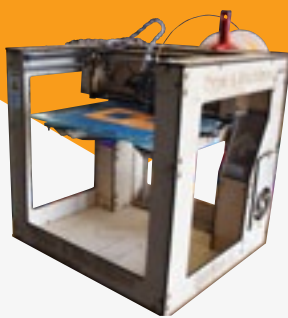
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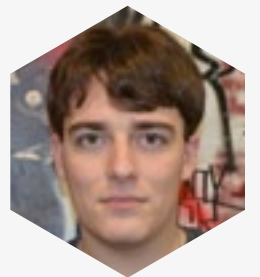
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ESC



VISUALIZED
Hedgehog
Particle Party



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REHASHED
Tweet Extension,
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TM

TIME MACHINES
Baudy Caller

On the Cover:
Illustration
by Jude Buffum



THE NEW CONSOLES ARE COMING

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EDITOR'S
LETTER



This week I'm writing from a special place: from the perspective of a Google Glass owner. Well, to be honest I'm not wearing them this *exact* moment — I'm actually at 30,000 feet, making the most of a Gogo connection, and when your phone is in airplane mode there's not much point in wearing the headset. Unless, of course, you're looking for a conversation starter. In that role, the headset performs impeccably even when turned completely off.

It's been an interesting couple days wearing the headset around, days I'll continue to chronicle on the site because I know many of you are eager to know what Glass is like. I know this because I've had dozens of strangers come up to me and ask, "What's it like?" Suffice to say, Glass is very interesting and the potential is compelling, but right now the thing is somewhat frustrating in its limited functionality. That'll change real soon as more developers get to grips with the Mirror API.

But enough about the excitement in my life, let's get on to the news. The buzz leading up to the annual Electronic Entertainment Expo in Los Angeles has been immense, but it did get muted somewhat this week. First, Microsoft announced that

it would, as expected, have a pre-E3 event in which the next Xbox would be unveiled. To assuage any doubt about that, the invite boldly states "A New Generation Revealed," a statement that cynics might see as a cheeky slight to Sony, who of course chose to not physically reveal its PlayStation 4 at an earlier media event. I, however, am no cynic.

Microsoft will surely still have a big pre-show event at E3 itself (Sony, too), but rather tragically Nintendo announced that it would not. For as long as I can remember — and I've been going to E3 since 1997 — Nintendo's pre-E3 event has been a highlight, and I'm honestly a bit sad to see it go. Nintendo will host a few smaller events, one for investors and one for media, but these seem much more focused on getting hands-on time with upcoming software rather than going up on stage and making charmingly boastful statements whilst Miyamoto waves a sword around.

To be frank, Nintendo doesn't have a lot to boast about at the moment. In its quarterly financial results, Nintendo indicated it has shipped just 390,000 Wii Us in the past quarter, a figure actually beaten by the previous-generation Wii, which shipped 470,000 units. That's obviously



far fewer than the company had expected, with net profits of 7 billion yen being about half of estimates. That is, however, a huge improvement over the 40 billion yen loss the year before and the company hopes a strong stable of upcoming games will improve things substantially this year.


Apple, meanwhile, is holding its own event at the same time as E3, but a few hours' drive north. WWDC was confirmed for June 10th to the 14th. Expecting some amazing new hardware to launch? Don't get too excited. After Apple's Q2 financial results were posted (a healthy \$9.5 billion in profit on sales of 37.4 million iPhones and 19.5 million iPads), Tim Cook indicated that we shouldn't expect any major new products until sometime in the third quarter. He also downplayed speculation about a larger iPhone, saying that bigger displays come with compromises like resolution and app compatibility. Apple will not make such a phone "while such trade-offs exist," says Cook, which could certainly be seen as a cheeky setup for Apple coming up with solutions for said problems.

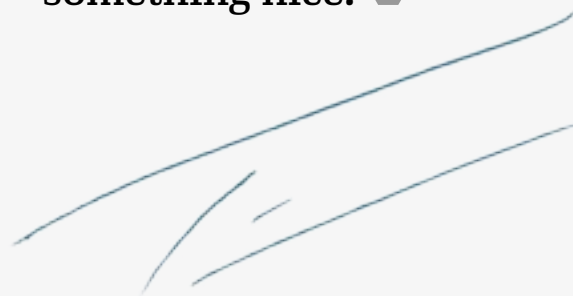
One final bit of financial good news: Netflix posted a \$2.69 million profit and picked up 3 million subscribers worldwide, two-thirds of those in the US. That pushes its US subscribers over the 30 million mark, meaning it now has more paying users than HBO. With any luck, HBO will see this writing on the wall and cut its cable ties soon.

A pair of important phones had their US details announced this week, starting with Samsung's Galaxy S 4. (Yes, that's

Galaxy S 4, not S4, S IV or SIV.) Verizon finally gave us a date and a price, saying the phone will launch on May 30th for \$200 (after a \$50 rebate). Many US carriers had planned on launching much sooner, including T-Mobile and Sprint, but are suffering from demand issues. Samsung says it'll ship phones "as soon as possible" and expects to have enough supply to meet demand "in the coming weeks."

That's a problem we're guessing BlackBerry would love to have, with its Q10 also getting launch details this week. The Canadian market (seemingly all major carriers) will get the phone on May 1st for \$199, but American carriers will be at least a few weeks later, and we're told to expect a price of \$249. A premium price for a premium keyboard, perhaps.

In this week's Distro we're giving you our review of Samsung's latest, the Galaxy S 4. We also have reviews of Nokia's latest, the Lumia 720, and the funky little ASUS Cube set-top box. Brian Heater dives into the new industrial revolution at TechShop, where, for \$125 a month, you can build whatever you want. We have a new Switched On, Modem World, IRL and an immersive Q&A with Oculus founder Palmer Luckey. It's all here and it's all for you, and if someone asks you what it's like, we sure do hope you say something nice. 



TIM STEVENS
EDITOR-IN-CHIEF,
ENGADGET



HP FACEPALM, THE EXPERIENCE DICTATOR AND TUNNEL VISION TECH



Touch article names
to read full threads

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INBOX



HOW HP LEARNED TO STOP WORRYING AND LOVE ANDROID

ISSUE 87,

APRIL 19TH, 2013

“HP needs Android to be a relevant consumer brand again. They are making little to no margin on [their] first Android tablet, but will need to sell quantity to gain consumer trust and relevancy given its recent hurdles as a company that likes to trip all over itself while throwing up.”

— FLYGUY29

GOOGLE GLASS GONE WILD

ISSUE 87,

APRIL 19TH, 2013

“I really want to get a pair of those Google glasses. If they can get the price down to \$300, then they will really have a winner. I wouldn't need a watch anymore, plus instant weather or news. So much potential.”

— SGGODSELL

“This is a good thing finally, but they could have come to this point sooner. If any company could have improved upon Android and the hardware experience that goes along with Android it would have been Palm. Palm had been doing what Android and iOS is doing for a long time before and with the right direction we could have seen some seriously

great innovation come from that company. HP took Palm into their own and stifled any chance Palm had to make a positive contribution to the world of Android devices.”

— ANDROIDTEAMSTRIKE

“The question isn't ‘How HP Learned to Love Android,’ it's ‘Will Android Love HP Back?’ Android is great, but there are very



few companies that really know what they are doing with it: Samsung and Google (Motorola + ASUS OEMS) of course, HTC once in a while, and Amazon in a bastardized way. I see nothing compelling coming from HP that would make me get their device over a branded Nexus or Galaxy device. And maybe that's the real problem with their Windows division in the first place."

— AMIRAMI

WHO'S DRIVING THIS THING?
ISSUE 87,
APRIL 19TH, 2013

"Uh oh... Joshua's writing about driving again.

Oh, wait..."

— MOLEMAN_X

"It is high time for some sober self-reflection when it comes to technology dictating our experiences rather than us controlling the environment. I recently bought an Android phone based on the illusion of user control of their electronic environment, but such control was largely superficial. It will go from devices/apps that give you no real choice on permissions and demand über access, or readily cede it, without your permission. In the end we are left with less control over what information we are fed, all for the purpose

SONY NEX-3N

ISSUE 87, APRIL 19TH, 2013

"If this camera had WiFi I would buy it. I want to post photos immediately. It is 2013 for goodness sake."

— JARRETTV

of selling us something or implanting ideologies in fertile minds. My hope is that privacy and control remain important to enough people that they decline to buy devices or software that savage privacy for profit. If the young folks don't start pushing back now, it will be too late later on."

— JAY67

**HTC FIRST WITH
FACEBOOK HOME**
ISSUE 87,
APRIL 19TH, 2013

"The best mid-cost phone of 2013."

— JUANMONTOS

"They should have went all out with the camera. Kind of silly to have a low-end camera when the phone's primary feature is Facebook."

— SO_RUDEZ

"Now we should all be waiting for Twitter to partner up with Samsung to release their 'Twitter Phone'.... A phone just for tweeting stuff that no one cares about."

— LIVINVIDALOCA



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EYES-ON

PALM PRE

**CLASSIC
EDITION**

THE SHINY SLIDER

After years of anticipation, Palm finally trotted out its webOS software on a glossy slider in 2009. The Pre came complete with a full set of keys for the QWERTY faithful, a 3.1-inch touchscreen to display the new operating system and a lustrous frame with fine details in tow.

**THE DAMAGE:
\$99-\$149 IN 2009**



*Tap for
detail*



SWIPES
WELCOME



HIGH-
GLOSS



TYPE
AWAY



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EYES-ON

PALM PRE

**CLASSIC
EDITION**



SWIPES WELCOME

A center button sports a partially transparent coat, which allows an LED to shine from within for touch gestures. Two more indicators light up on either side following those thumb movements closely.



ENTER

EYES-ON

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PALM PRE

**CLASSIC
EDITION**



HIGH-GLOSS

The luster of the Pre's outer shell bolsters its striking curved appearance, which also wields a stellar in-hand feel. Even the stylized Palm logo around back doesn't detract from the aesthetics here.



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EYES-ON

PALM PRE

**CLASSIC
EDITION**



TYPE AWAY

The keys here offer a solid typing experience and are draped in a rubbery material with a significant amount of travel. The tiny, carefully spaced chiclets get cozy on the portrait slider via a slightly recessed tray.





SAMSUNG GALAXY MEGA 6.3

When Samsung said it was having a little soiree to celebrate the launch of the Galaxy S 4, we took the company on its word. While everyone wanted to play with the latest flagship, we thought we'd take some time to get to know the 6.3-inch Galaxy Mega a little better. First things first: we really thought that a phone of such size would be a stretch — both figuratively and literally. But when we picked up the device, it felt surprisingly comfortable to hold and much lighter that you might anticipate.

As for the design, make

PRICE: TBD
AVAILABILITY: TBD
THE BREAKDOWN:
DESPITE ITS LARGE BUILD, THE GALAXY MEGA HAS A SURPRISINGLY NICE IN-HAND FEEL.

to boot. The “HD” screen — in the short time we spent with it — didn't actually look bad. Of course, the real acid test will come when we get to put it through its paces in a proper review.

As for general performance, again, we found it nimble enough while navigating menus and TouchWiz (there's An-

droid 4.2 underneath). The 1.7GHz processor might not have the pure might of the two Galaxy S 4 processor variants, but it handled the demo videos, browsing and other material as adequately as you might expect.

no mistake, Samsung merely took the Galaxy S 4, and gave it a good zap with the en-largo-gun. The curves, the home button, the bezel are all taken from its little sibling. The color scheme, too, was lifted from the recent Galaxy palette, with the models on display sporting the a blue-checked pattern. What clearly isn't the same is that screen. Not just because it's so much bigger, but also because it's a lower resolution,



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LYNX A 3D CAMERA

Earlier this year, a group of enterprising students from the University of Texas unveiled the Lynx A 3D camera and asked for money to fund its construction on Kickstarter. Since then, they've soared past their funding goal of \$50,000, and are getting ready to ship out their first set of cameras. At DEMO Mobile SF, we finally got to see a prototype unit for ourselves and watch it scan someone's head in real-time. For the uninitiated, the Lynx A is billed as a point-and-shoot 3D camera that uses Kinect-esque hardware to obtain depth mapping and imaging info from your surroundings. Using GPU computing power and some custom code, it turns that data into 3D scene and object models or motion capture, and it displays the finished models on its 14-inch screen a minute or two after

PRICE: \$1,799

**AVAILABILITY: JUNE 2013
(BACKERS)**

THE BREAKDOWN: THE LYNX A HANDLES 3D MODELING AND MOTION CAPTURE WITH A 14-INCH TABLET FORM FACTOR.

it's finished recording — all for \$1,799.

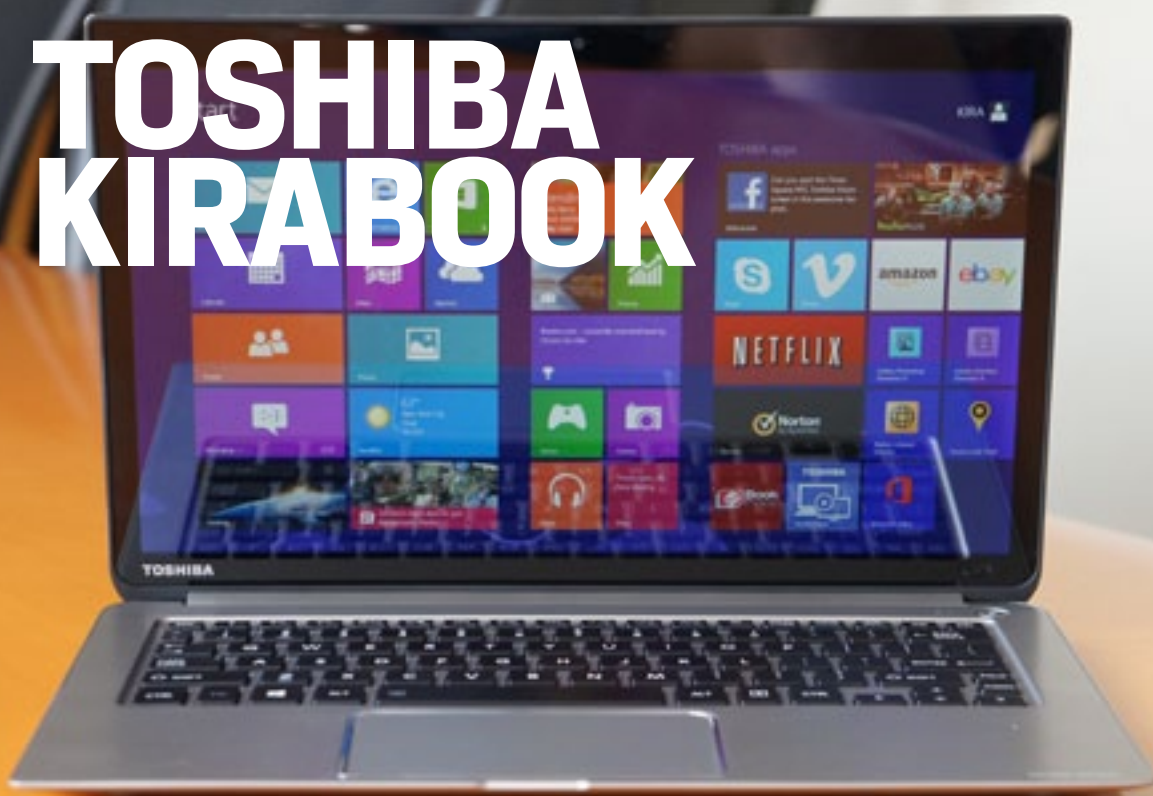
The Lynx A we witnessed working in person was a prototype unit, so fit and finish were far from being retail-ready, as wide gaps and exposed screws abounded. Lynx assured us that the units going out to its backers will not only have a more polished appearance, but will also be six times more accurate and 30 percent smaller due to newer hardware components. Despite the prototype's rough appearance, the modeling process went off without a hitch. It was able to scan two-thirds of a human head in about a minute and within a couple minutes, it was displaying a 3D model ready to be manipulated and printed out by a Replicator or a Form 1.



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TOSHIBA KIRABOOK



variety 1,366 x 768 panel. Everything is sharper — even the lettering on the Start Menu — though we would have just as easily assumed this was a 1,920 x 1,080 panel. Unfortunately, though, as much care as Toshiba otherwise put into the design, it clearly skimped on the viewing angles.



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The suits in Tokyo were so fed up with Toshiba's low-rent reputation that they decided to launch a premium line to prove the company is indeed capable of making high-end machines. That line is called KIRA, though for now there's just one product to speak of: the 13-inch Kirabook. For the money, you get a mix of modern design, top-shelf components and a whole lot of sucking-up from Toshiba's technical support. Topping the list is a 2,560 x 1,440 display, making this the first Windows Ultrabook to sport such a high-res screen. The minute we saw it, we knew this wasn't your garden-

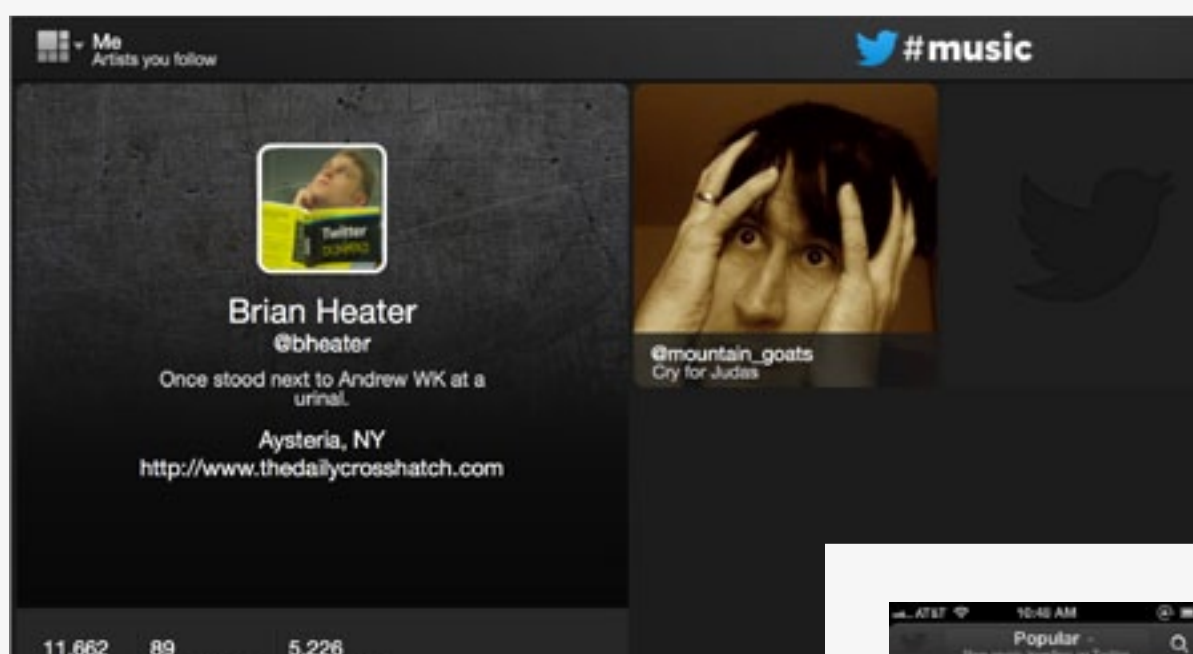
PRICE: \$1,600-\$2,000

AVAILABILITY: MAY 12TH

THE BREAKDOWN: DESPITE SUBPAR VIEWING ANGLES, THIS IS ONE OF TOSHIBA'S BETTER DESIGNS IN QUITE SOME TIME.

The machine is made of magnesium through and through, with pressed metal on the lid and a die-cast variety on the bottom. Impressively, the Kirabook weighs 2.9 pounds, and that's with the touchscreen. Without, it's just 2.6. Like the Air and many other Ultrabooks, the Kirabook has a wedge shape, with the machine getting narrower as you move away from the hinge. Somehow, though, Toshiba managed to keep the edges round, similar to lots of other machines in the company's lineup. It's only around the palm rest where the edges get really sharp, but you won't notice it when the notebook is closed. According to Toshiba, the keyboard attempts to correct some of the flaws on the Portege Z835 / Z935. Not that we were able to do a side-by-side comparison with the old model, but it certainly felt easier typing on the Kirabook.





TWITTER #MUSIC (iOS AND WEB)

Surely no one was surprised when Twitter formally announced the launch of its #Music service. Frankly, we're just glad to finally get our hands on the promised big news, which rolled out in both browser-based and iOS formats. The layout of the browser app is about as simple as you'll find. Log in to music.twitter.com, and you're greeted with album covers defaulting to the most popular tracks. Beneath each cover, you'll find the artist's name, in the form of their hashtag, and below that, the name of the track. There's also a handy number in the upper corner of each, so you know how things rank.

Hover over the artwork and you'll trigger a play icon. Click that and a dynamic, bantam player will pop up in the lower left-hand corner. The track defaults

to an iTunes preview. From the player, you can advance to the next track on the list, buy the song on iTunes or share your current tune. If you happen to be a Spotify or Rdio user, go up to the upper right-hand corner of the screen, click Play Full Tracks and you'll get the option for logging in to do just that.

To the left of that button is a link to the settings, where you can

filter out explicit tracks and use the search feature. The results appear on a clean, well-organized page, with the top entry arriving in the form of that artist's Twitter head. You'll also get tracks that you can play directly on the page, including the artist that another artist follows. Currently only available on iOS, the mobile app functions in much the same fashion, though it's a bit more squished. The player looks much the same, in the bottom-right corner of the screen, though it's out by default. **D**

PRICE: FREE

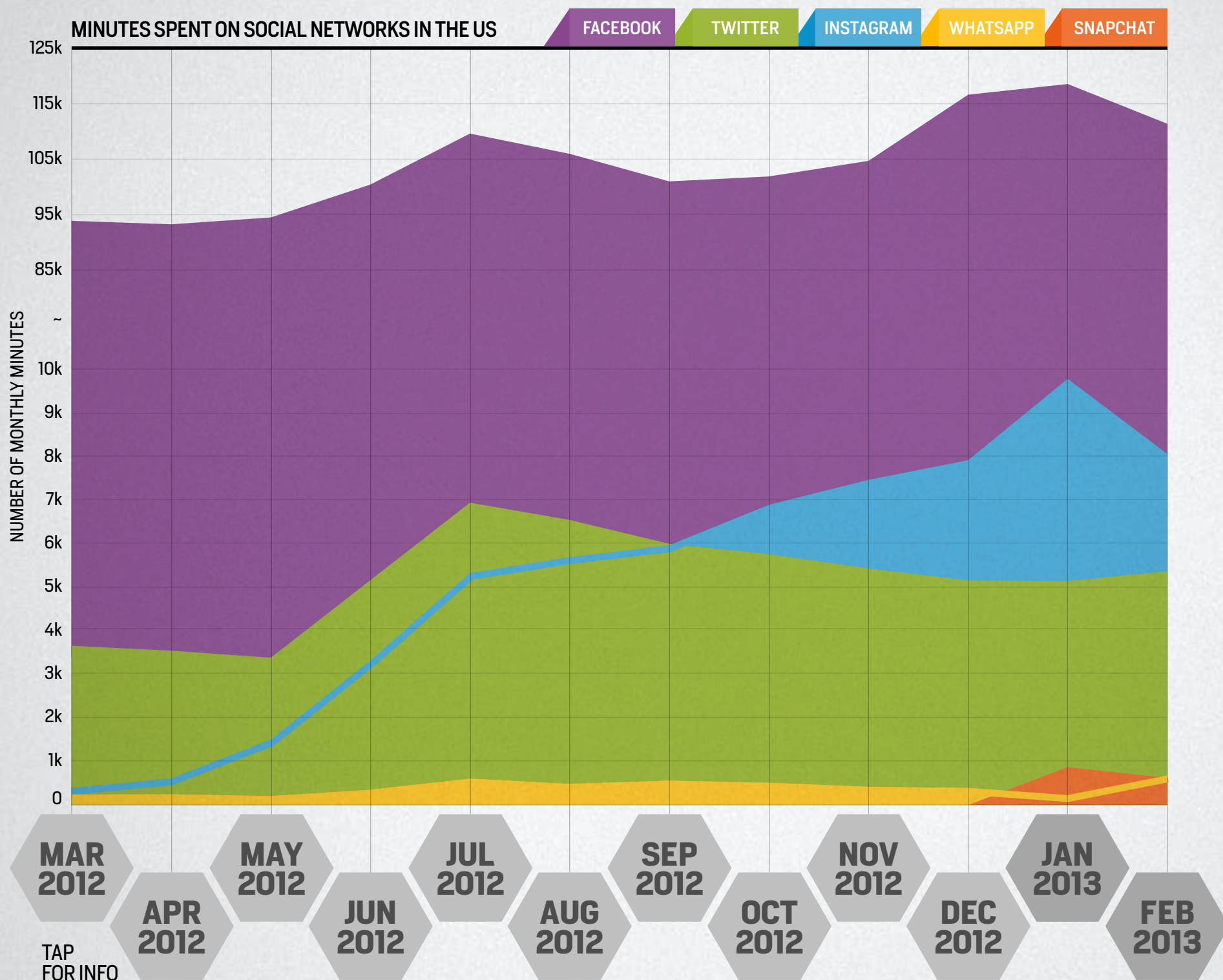
AVAILABILITY: NOW AVAILABLE

THE BREAKDOWN: TWITTER'S SERVICE KEEPS IT SIMPLE, BUT DOESN'T OFFER MORE THAN THE CURRENT SERVICES WE EMPLOY.



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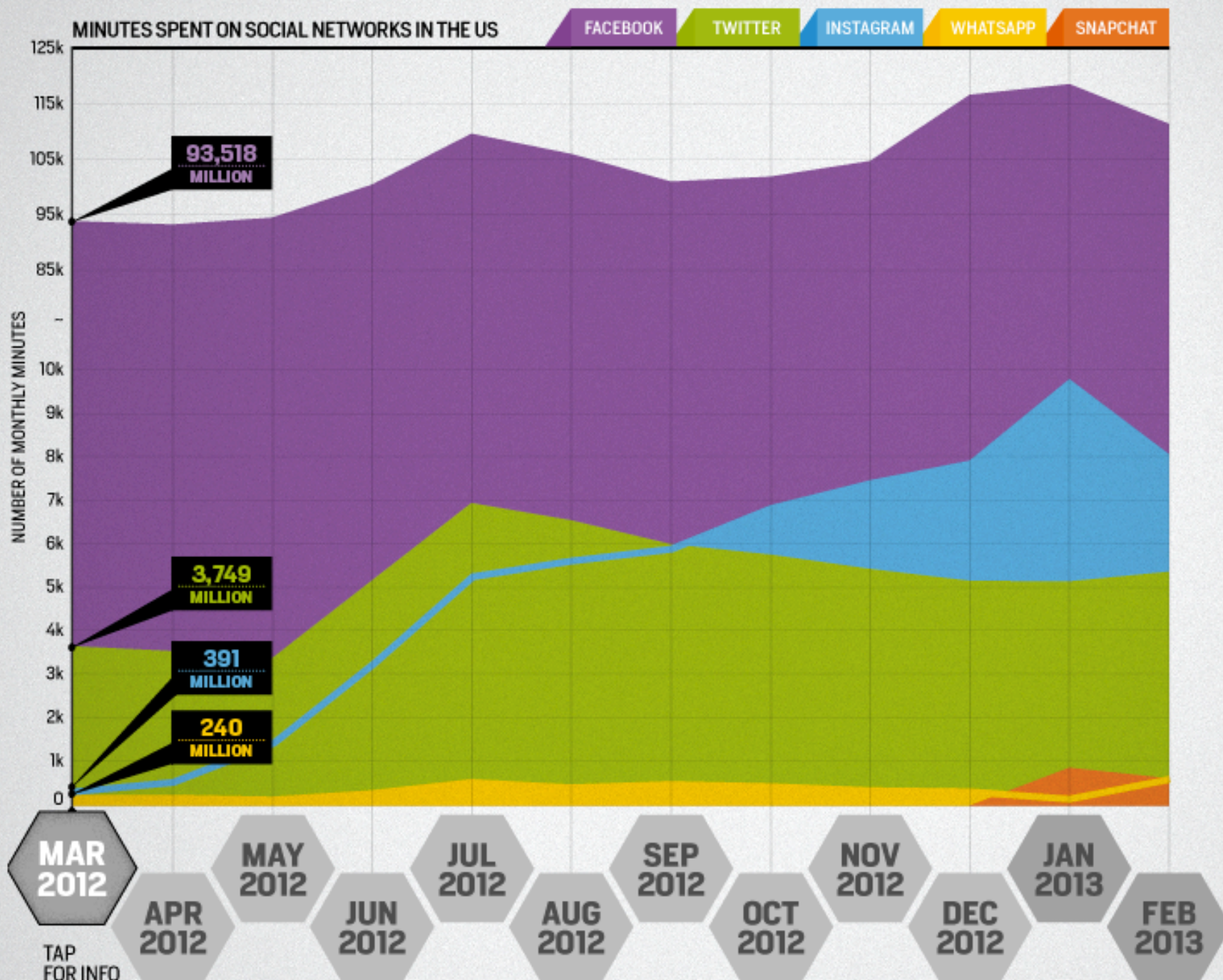


The Social Sands of Time

If asked, “Where did the time go?” one could plausibly answer “Facebook,” at least for the connected world at large. According to recent numbers from comScore and J.P. Morgan, the social network’s IPO last year didn’t end in disaster. On the contrary, Facebook has continued to pile up a lion’s share of user connectivity minutes. When compared with other heavy hitters

over the first two months this year, the outfit snagged just under 90 percent of users’ social surfing time. Instagram has seen its share on the upswing since its Android app launched last year, and Twitter has steadily consumed our time too, but both those networks pale in comparison, with only about 7 and 4 percent, respectively in early 2013. — *Jon Turi*





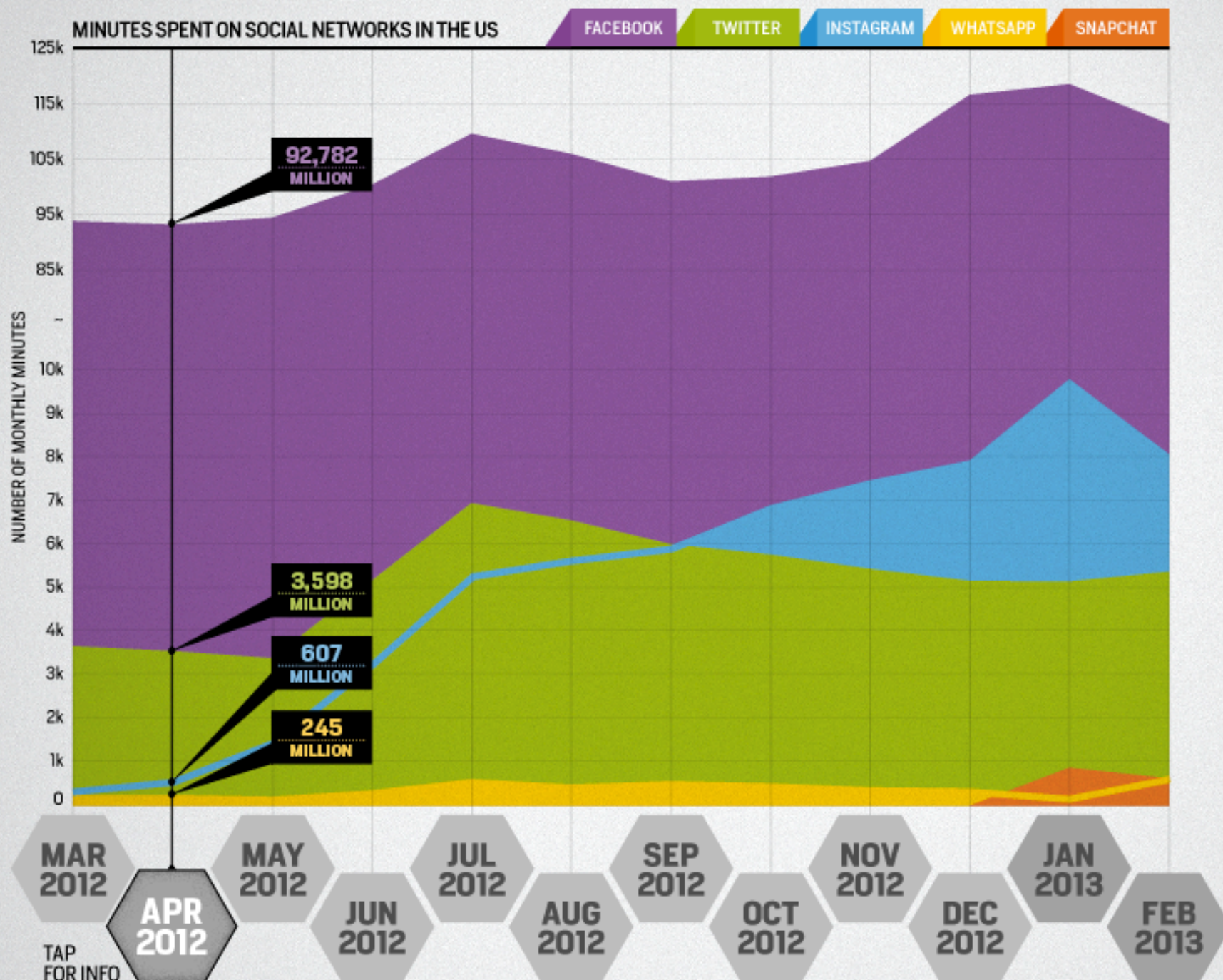
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TOTAL MINUTES ARE DESKTOP AND SMARTPHONE (IOS AND ANDROID) USE COMBINED, EXCLUDING TABLETS.





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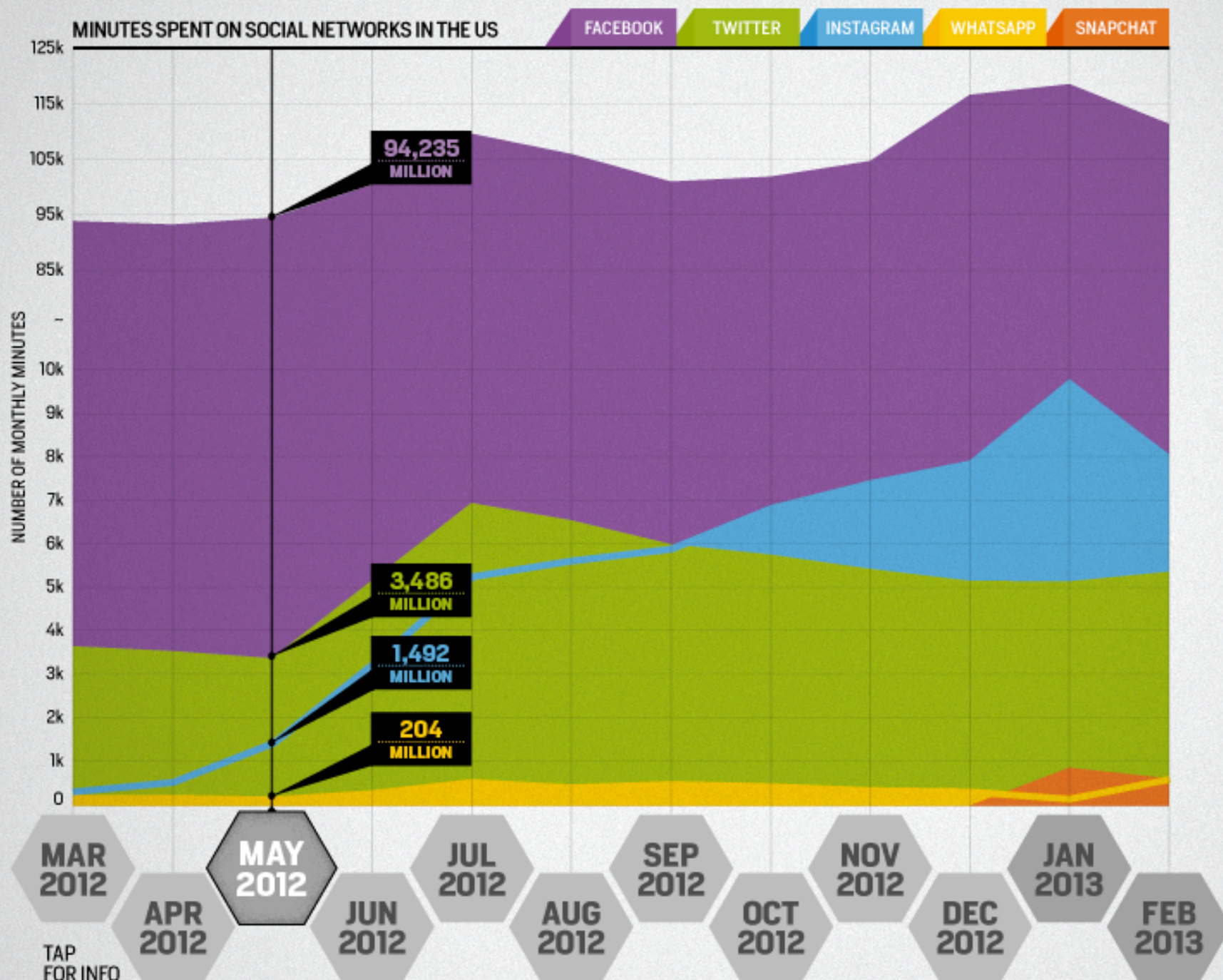
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The Social Sands of Time

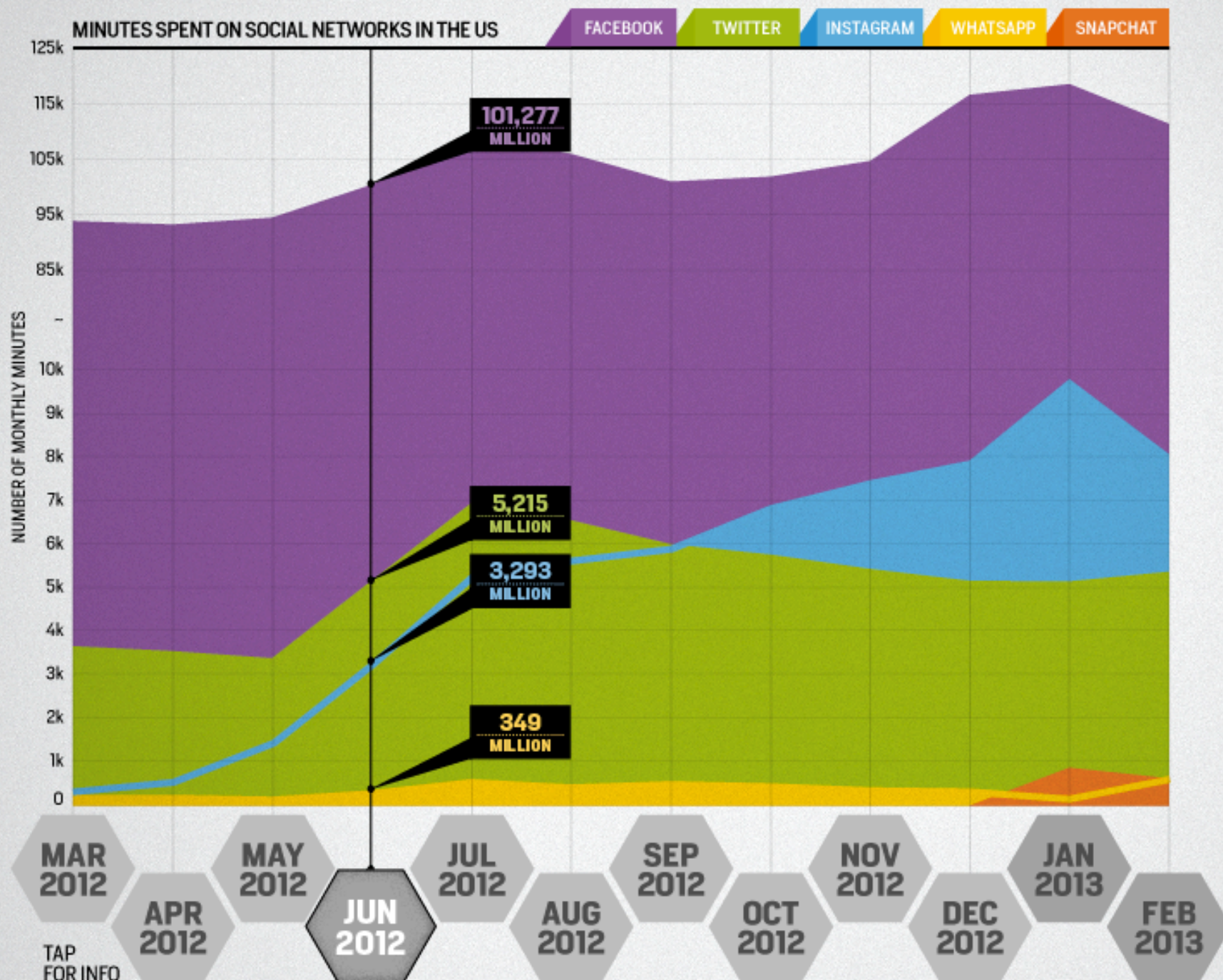
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SOURCE: COMSCORE / J.P. MORGAN CHASE





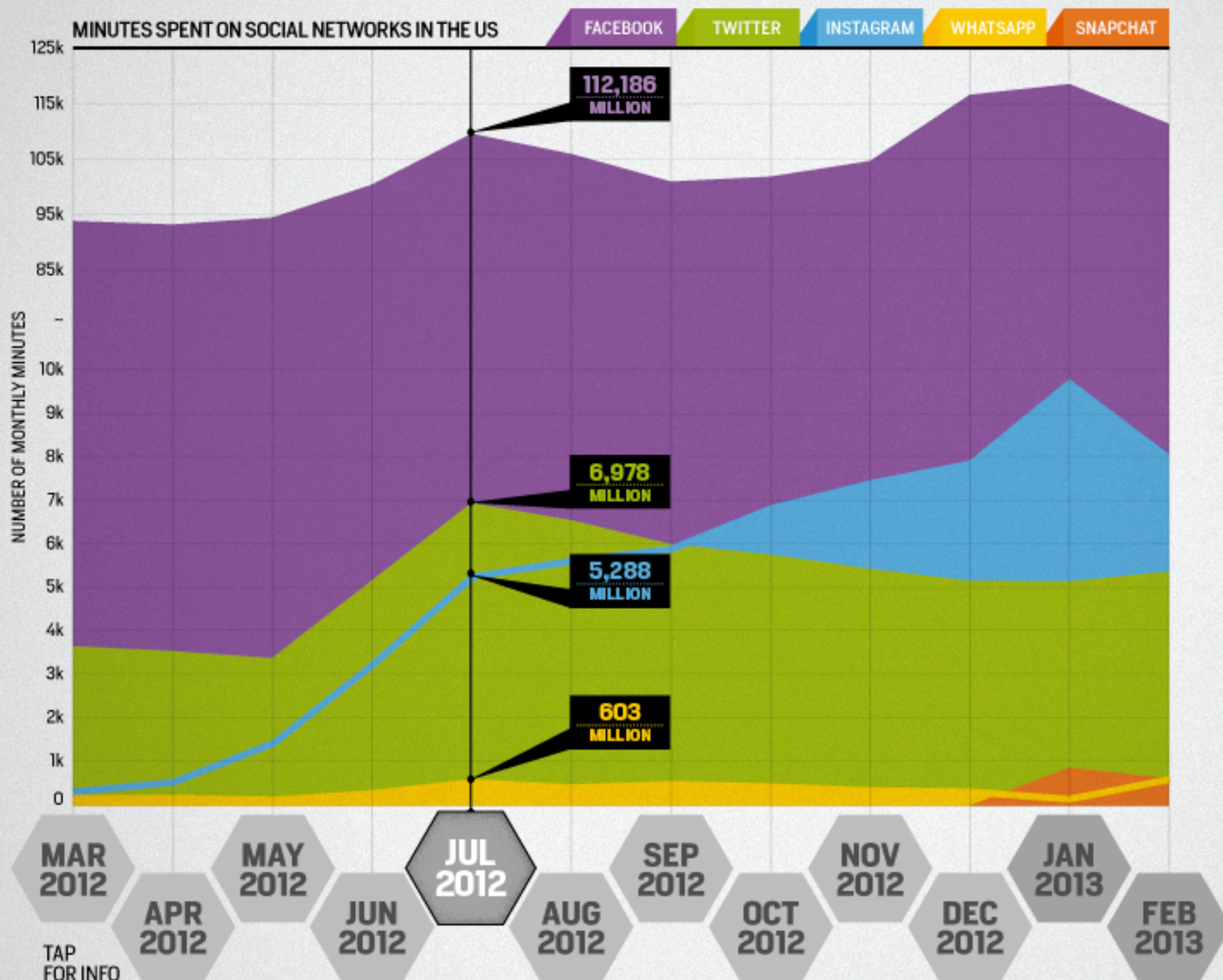
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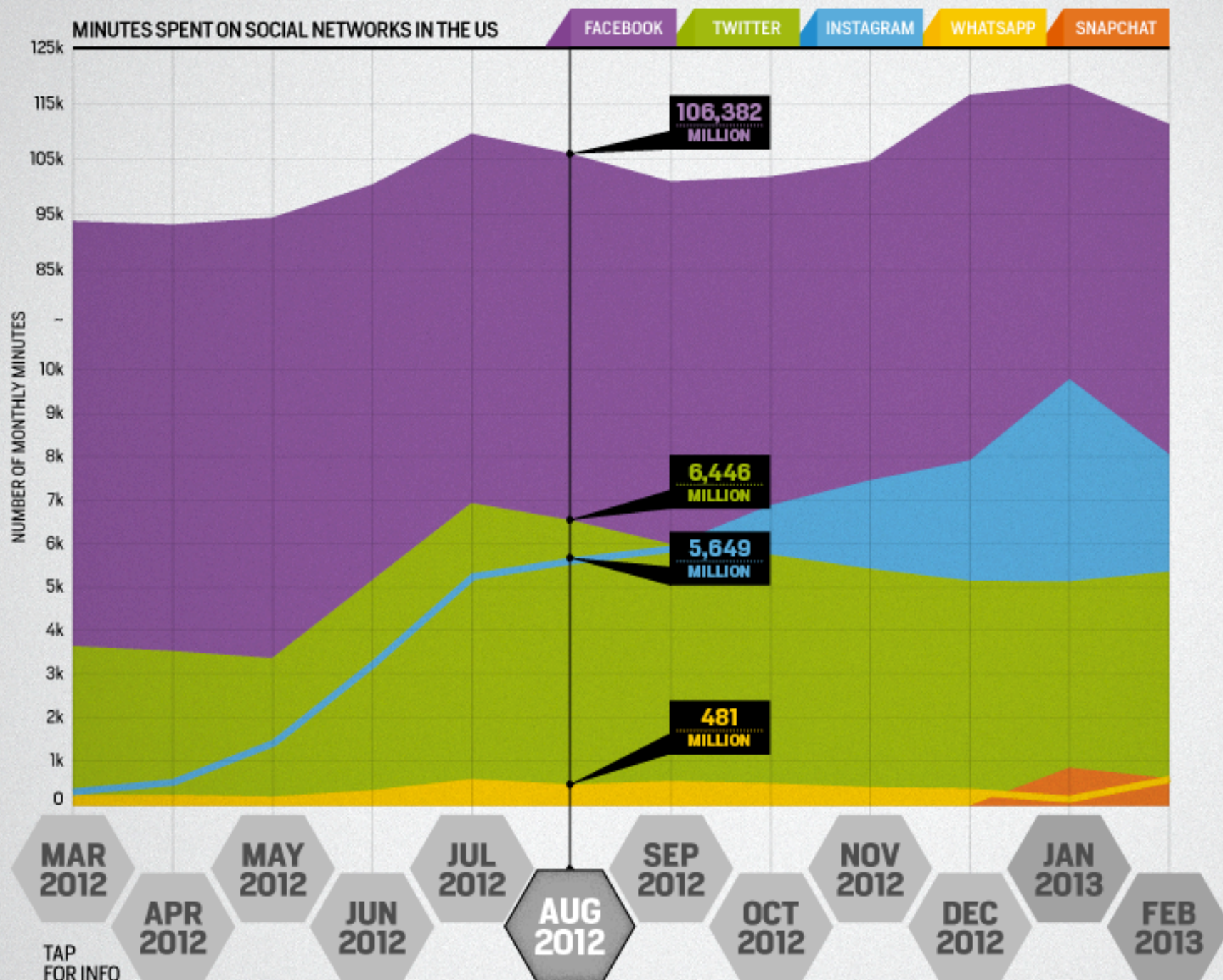
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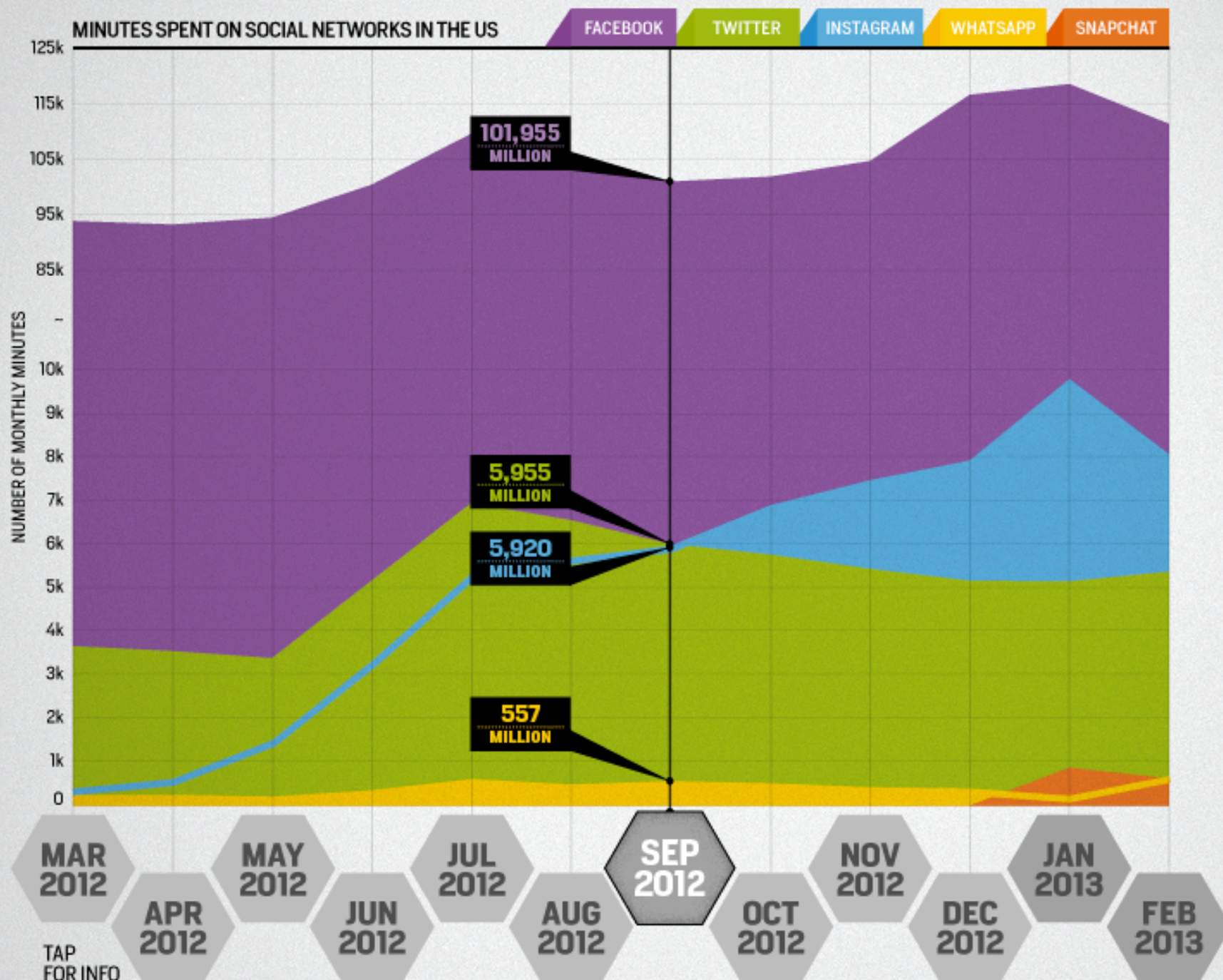
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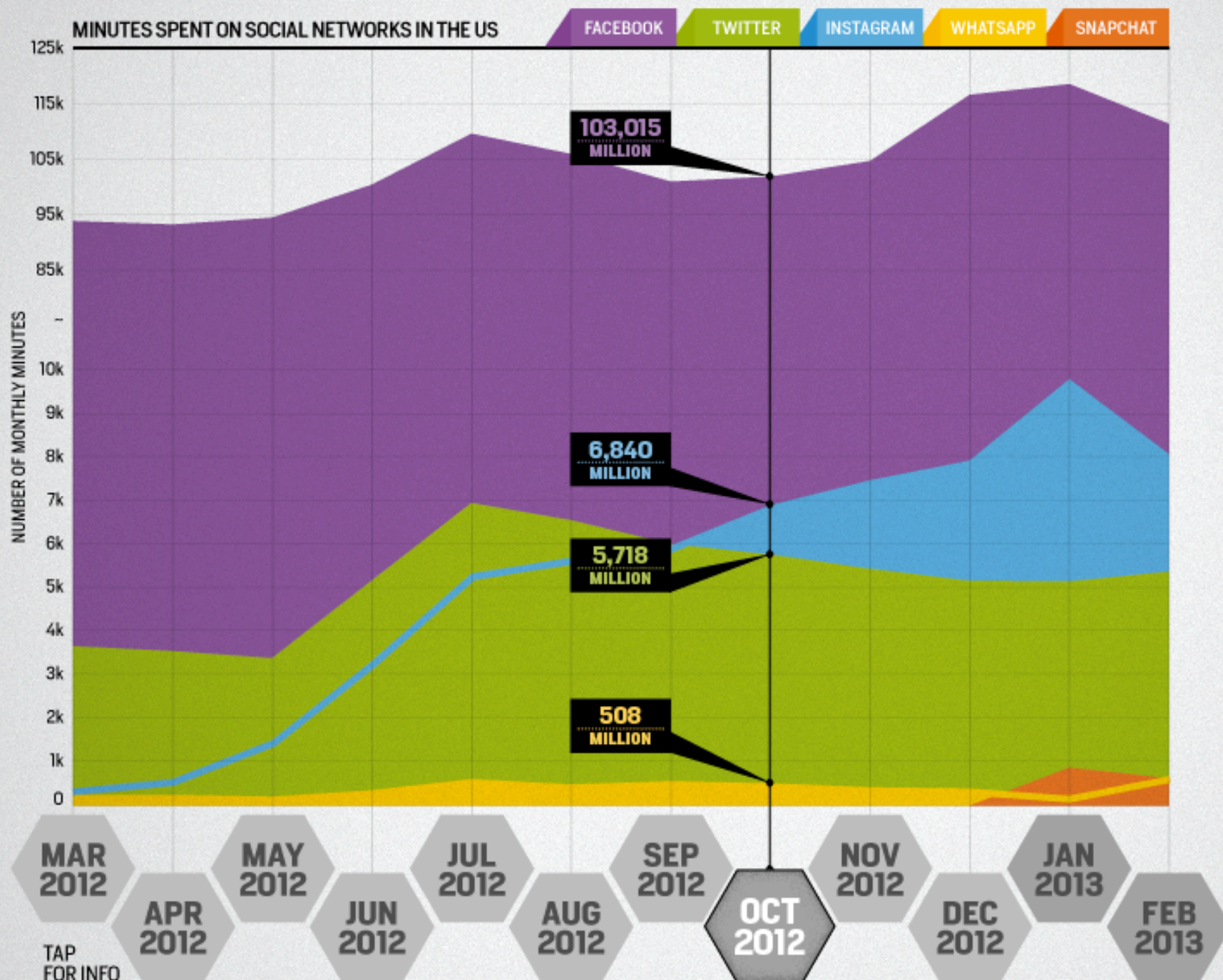
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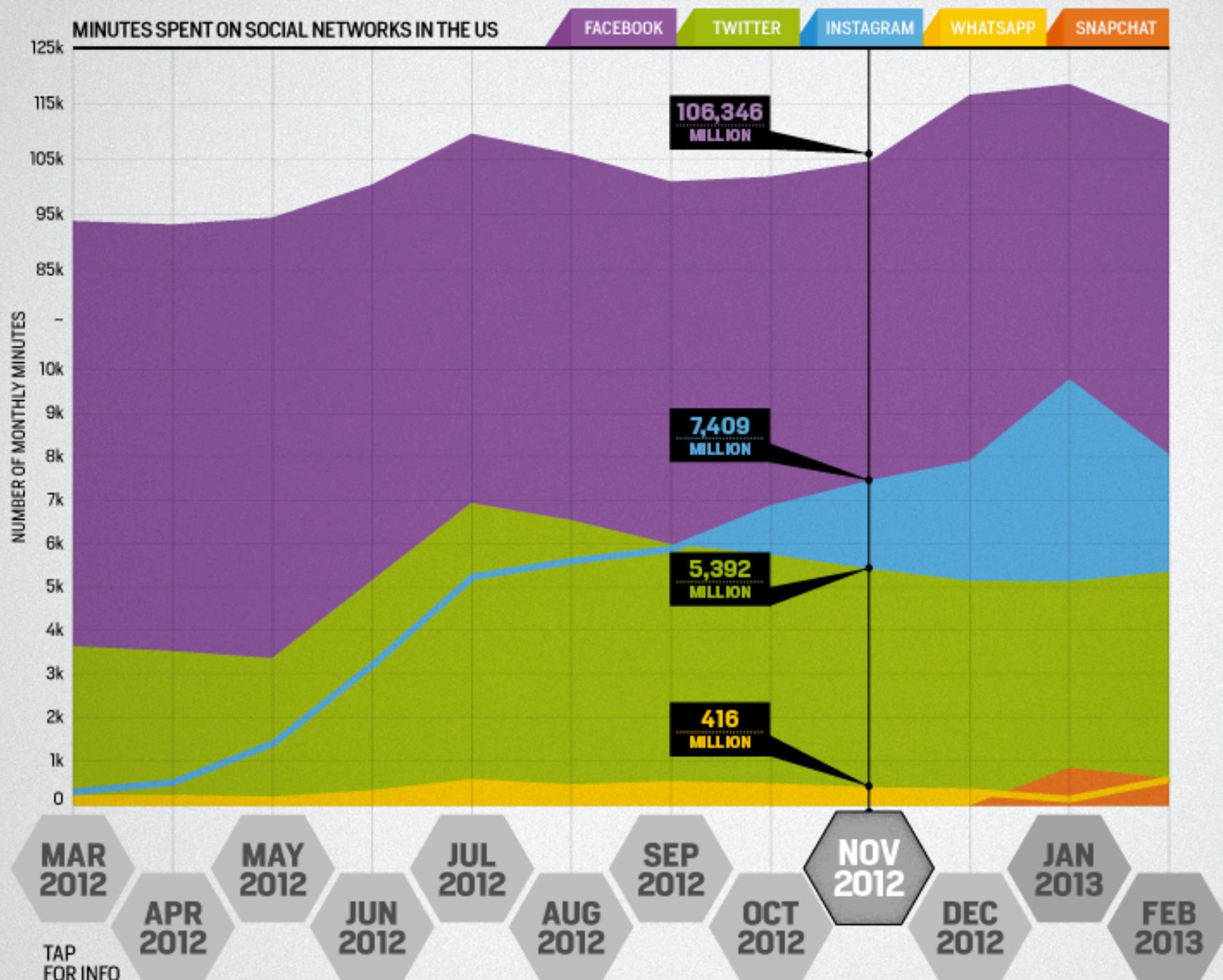
The Social Sands of Time

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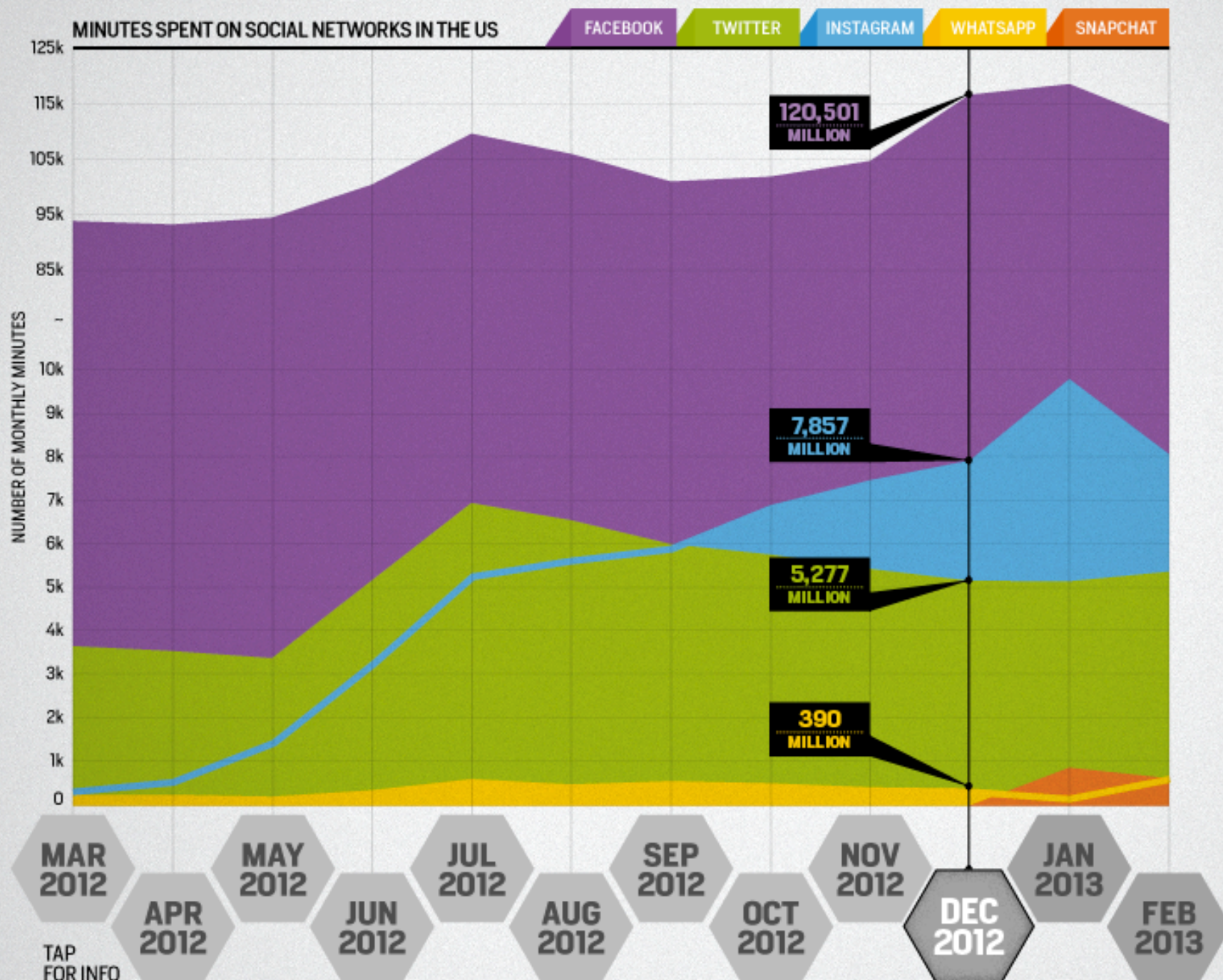
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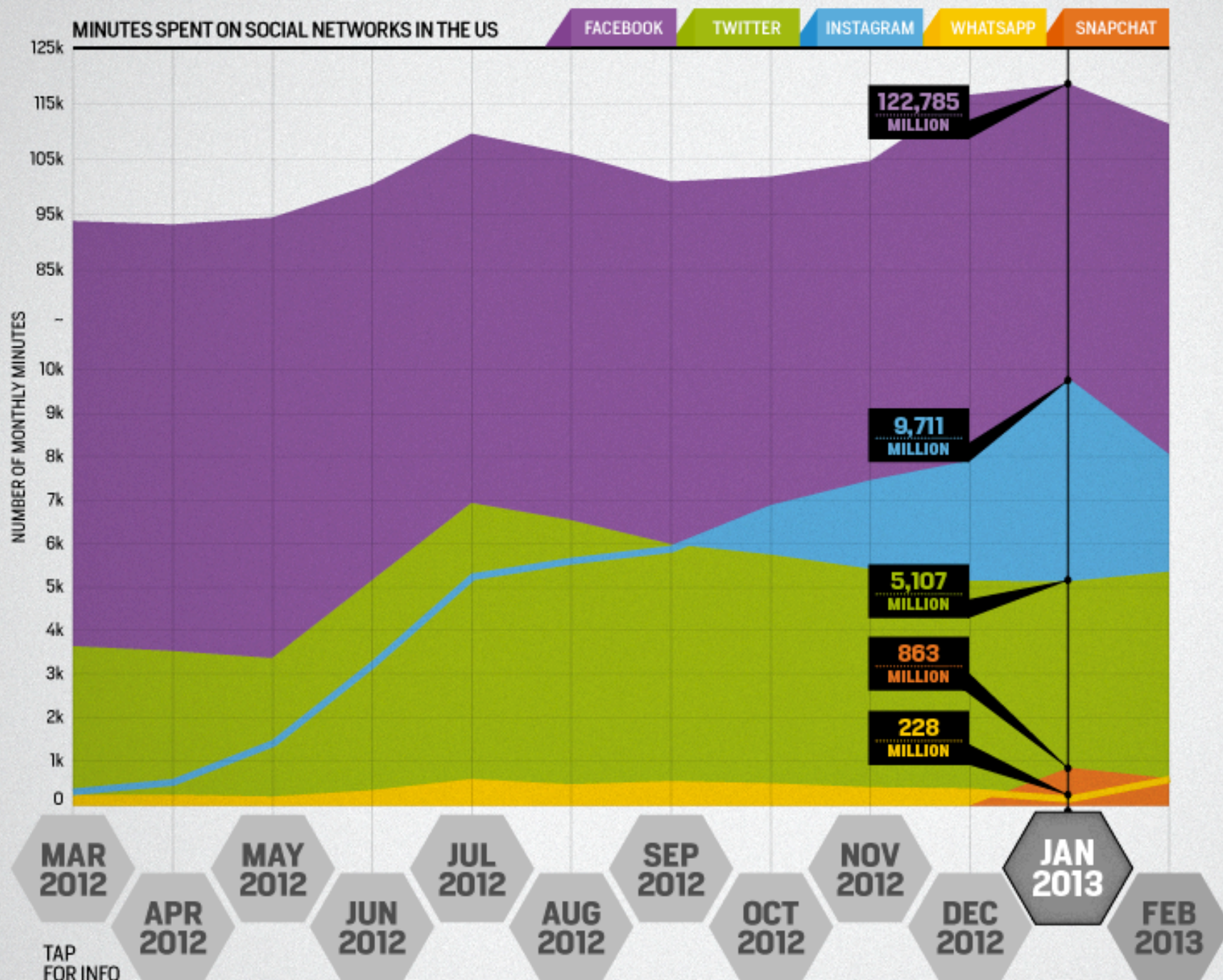
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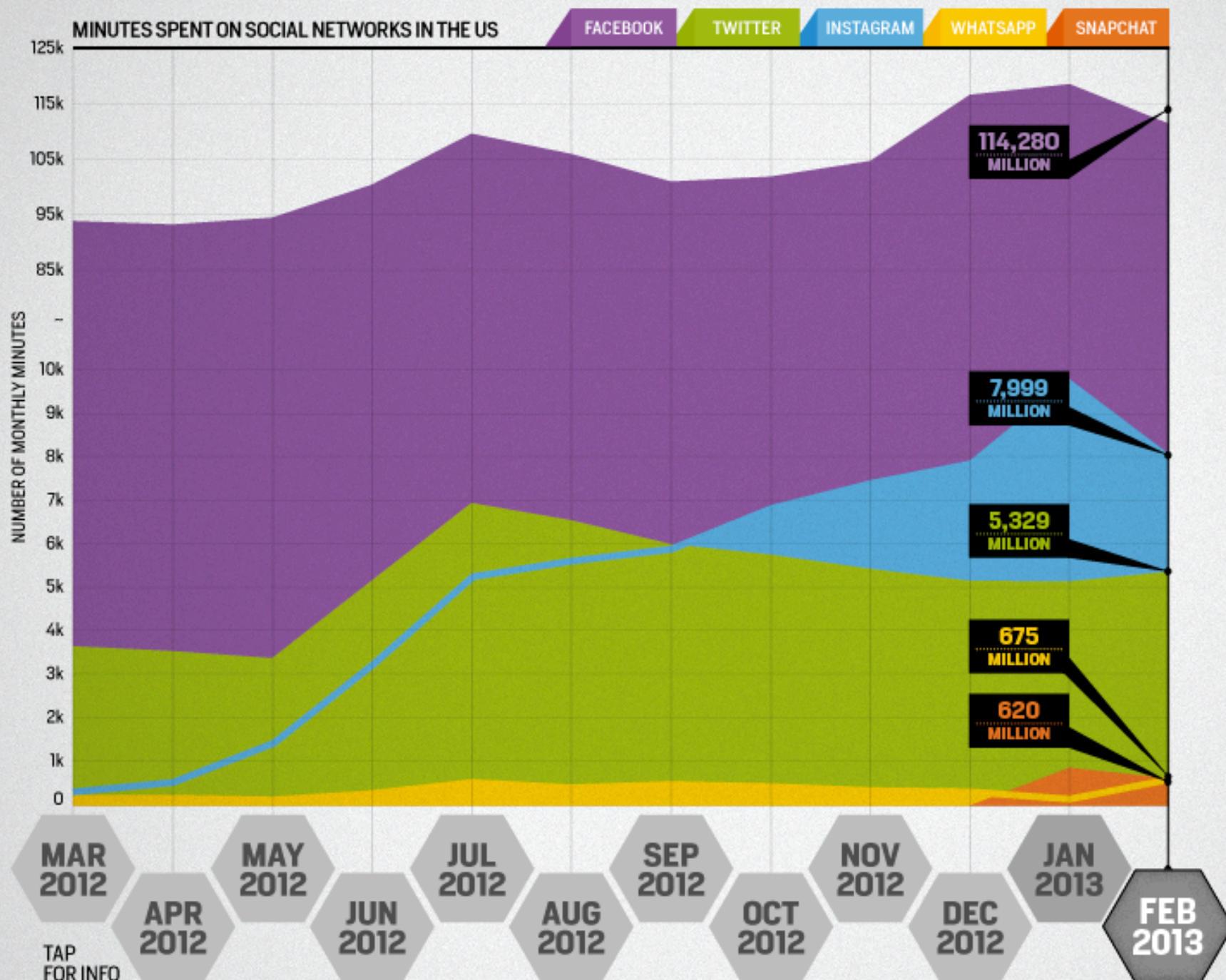
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Wired @ 20

Wired started celebrating its 20th anniversary a bit early last year by releasing a special edition of its first issue for the iPad, but it's now back to do things properly this month. That includes another special issue, this one collecting some of the stand-out feature articles from the magazine's 20-year run — Neal Stephenson's legendary "hacker tourist" piece on wiring the planet is here, as is William Gibson's Singapore travelogue from *Wired*'s very early days, to name just two examples. Complementing that is an all-new 20th anniversary special put together for the occasion, including a mix of dozens of short and long features looking back at the past two decades; naturally, that also includes a look at *Wired* itself, which comes in the form of an oral history chronicling the lead-up to its first issue.



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stories

The Rise and Fall of AMD

By Cyrus Farivar and Andrew Cunningham, *Ars Technica*

AMD isn't exactly out of the game, but there's no question the chip-maker has seen some rather tumultuous times — during this past decade, in particular. In this two-part article, *Ars Technica*'s Cyrus Farivar and Andrew Cunningham trace the key parts of that history, from the company's biggest successes that challenged Intel, to some of the excesses seen at its peak, to the difficult situation it now finds itself in.

Spaced Out

By Greg Klerkx
Aeon

The heyday of the space race gave birth to some big goals for future space exploration, not the least of which were ambitious plans for future space stations. In this essay for *Aeon*, Greg Klerkx looks at both those early goals and the current state of our permanent presence in space (as well as the influence of science fiction), while also looking ahead to new goals that could drive future space stations.

The Power of Gear: How Technical Equipment Redefines Our Relationship With Extreme Environments

By Geoff Manaugh and Nicola Twilley, *The Atlantic*

This piece isn't strictly about outdoor tech in the gadget sense, but it is a fascinating discussion with The Mountain Lab's Scott McGuire about how different types of technical gear like backpacks, clothing and tents can actually change our relationship with more extreme environments.



MICROSOFT'S SMALL TABLET TRAP

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FORUM

SWITCHED
ON

BY ROSS RUBIN

BASED ON LAST QUARTER'S GLOBAL PC shipment numbers, Microsoft continues to feel the pain in making the case for Windows as a viable tablet operating system. Theoretically, the dual-identity (Windows 8/RT) operating system has everything it needs to be a contender, but the promise is ahead of the reality on three interdependent fronts: chip-level hardware, legacy support and app software.

For example, if x86 chips were more competitive with ARM processors from a performance-per-watt perspective, then Microsoft wouldn't be as reliant on Metro-style apps for functionality. And if more developers were creating Metro-style apps, then consumers wouldn't have to go to the legacy desktop mode as much to get things done. (Until the company releases a Metro-style Office, Microsoft really can't wag its finger too much at third parties.)

While Microsoft has done a good job evangelizing for Windows Phone apps (an effort that will pay dividends for desktop Windows down the line), there simply wasn't a critical enough mass to make Windows RT a compelling proposition at its launch. The company was willing to seed the market with Surface RT, spending on television ads to show how a tablet and a PC could be one.

Now, Microsoft appears to be chasing industry trends again by encourag-



“As Microsoft’s Metro-style app arsenal grows, it has as good a shot at the smaller tablet space as its main rivals.”

ing smaller, less expensive tablets, although price points will likely be more along the lines of the iPad mini or Samsung Galaxy Note 8.0 than Amazon’s Kindle Fire HD. In doing so, it stands to fill in a substantial screen-size gap between the largest Windows Phone devices and today’s smallest Windows tablets — a range that Samsung seems determined to fill in at every third-inch increment using Android. However, in pursuing smaller tablets, Microsoft is playing against its strengths.

Resolution restrictions haven’t been the main reason why major PC companies have gone big in their touchscreen products. It’s because as tablet sizes get smaller, the demands of more sophisticated software — especially mouse-controlled traditional desktop software — become more difficult to fulfill. What’s the value of legacy Windows apps on a 7-inch or 8-inch device? Didn’t the market reject that with the fall of netbooks? If you need to print so desperately from a small tablet, pick up an HP Slate 7.

Perhaps Microsoft will again try to pave the way with a smaller version of

Surface. However, to the extent the existing Surfaces’ dog has wagged, the tail causing it to do so has been Microsoft’s impressive battery- and Bluetooth-free click-in keyboards. Logitech has shown that one can create a usable slim keyboard for the 8-inch iPad mini, but there are more ergonomic compromises (for example, the lack of a Tab key and half-width semicolon and apostrophe keys) than seen on its counterpart for the larger iPad.

The best argument for a Windows tablet is that it can work as a main productivity machine with familiar apps, while allowing one to engage in more casual touchscreen-based content consumption. As Microsoft’s Metro-style app arsenal grows, it has as good a shot at the smaller tablet space as its main rivals. Up until now, however, the whole Windows tablet story has been around being “more” — more display size, more legacy support, more versatility — which will prove a particular challenge when transitioning into a subcategory where less is more. 



NOTHING IS NEW. IT'S BEEN DONE BEFORE.



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FORUM

THIS IS THE
MODEM WORLD

BY JOSHUA FRUHLINGER

IT'S FUNNY HOW THINGS come back around. When I was growing up in the '80s, music was looking back at the '50s and '60s and re-creating it into some of the best bands the world has seen. Paul Weller wouldn't have become the songwriter he is had he not grown up on the Beatles. Likewise, Paul McCartney wouldn't have become the genius that he is had he not been raised on Little Richard. And now, bands are looking back at the '80s and re-doing that explosive era — with both good and bad results that I will not go into here lest I make new enemies.

Culture is cyclical, and we're beginning to see that technology is bound to follow that same rinse-and-repeat formula.

Some examples to ponder:

SMART WATCHES

Way back in 1946, a comic-book detective named Dick Tracy confounded

readers when he slid up his sleeve to reveal a 2-Way Wrist Radio. This tiny device allowed him to talk to other detectives wirelessly and with seemingly endless power. The device added video in 1964 and remained a dream for decades. That is until 2002, when Fossil released the Abacus AU5005



“These days, several cars, including some BMWs, Audis and Hondas offer HUDs, but they remain luxury options that are rarely chosen by shoppers.”

Wrist PDA. This device ran Palm OS and included a tiny stylus that slid out of the buckle. I had one and everyone I showed it to thought it was silly. And it was — it was huge and had to be charged every single night. The device ended up in my desk drawer, slipping into obscurity and is now a bit of a collector's item that isn't to be taken too seriously.

Now it seems smart watches are making a comeback, but this time as an extension of our smartphones. The Pebble Watch saw early crowdfunding success even though it is struggling to meet both production demand and consumer expectations. Meanwhile, a little company called Apple appears to be poised to release an iWatch of its own. Maybe this time the smart watch will stick given the fact that we all carry powerful portable computers — smartphones — with us all day that can act as receivers and servers and finally make the smart watch more than a trick up our sleeves.

HUDS

HUDs, or head-up displays, have been the domain of fighter jets and fictional robots in movies for years. Modern fighter jets include a mix of HUDs and head-mounted displays to deliver information to multitasking pilots with great success, but these devices haven't found a home in consumer electronics despite multiple attempts. The Nissan 240SX featured a HUD system that displayed a projected speedometer on the windshield, but the company let the technology fall low once the 240SX was shuttered. It seems no one was asking for it. These days, several cars, including some BMWs, Audis and Hondas offer HUDs, but they remain luxury options that are rarely chosen by shoppers.

This time around, though, Google promises to make the HUD a true information portal with its Glass wearable display and camera system. Google is taking its time testing the device with power users and encour-



“My father was always super proud of his Swiss Army knife. It could cut, tighten, clip, tweeze, file and even pick teeth.”

aging developers to offer up their apps and content for the device, but time will tell if the relatively steep price tag and social stigma of wearing an electronic visor will become a thing for which we're all ready.

CONVERGENCE

My father was always super proud of his Swiss Army knife. It could cut, tighten, clip, tweeze, file and even pick teeth. “It's all we need for survival,” he'd say.


In the '60s, televisions joined forces with record players and designer furniture to become huge consoles of entertainment doom. When consumer electronics took off in the '80s, one of the first things manufacturers did was mash complementary products together into super gadgets. I clearly

remember the day the answering machine joined the wireless phone — everyone ran to his or her local Circuit City to hop on board.

In the '90s, as cellular technology was developing at feverish speeds, designers took a moment to allow the technology to breathe on its own. Cell-phones were just that — they made phone calls. People still used calculators, PDAs and portable DVD players. Now that the smartphone is powerful and reliable, though, we're cramming as many functions into the devices as possible. Huge markets of apps that harness these functions probably spell no end to the portable convergence trend.

Perhaps someone will release a phone that just makes calls and we'll all turn back, but that's looking less likely every fiscal quarter.

Either way, as device designers come up with something new and unique, they throw it at the market; the market says “meh”; and they forget about it. Then, years later, another manufacturer tries the same thing again, perhaps with better results. Maybe it succeeds this time around because the technology has improved or it's designed better. But maybe it's because we've finally developed a taste for the new-old tech. Or maybe it needs another round.

So if you're sitting there racking your brain for the “next big thing,” look no further than that pile of dead devices in your desk drawer. You just might find the future in your past. 



REVIEW

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NOKIA LUMIA 720



Does the **Lumia 720**
offer enough to justify
a higher price than its
WP8 stablemates?
By Jamie Rigg

With the shared unveiling of Nokia's Lumia 720 and Lumia 520, the company's running flush of Windows Phone 8 models was complete. All WP8 handsets we've reviewed essentially fit into two distinct tiers based on shared core specs. That begs the question: why come out with two new models now when both share the same SoC, amount of RAM and screen resolution as the established Lumia 620 and HTC 8S? Obviously, there are differences in design, cameras, display tech and all the other bobs and bits that create the 720, but is it worth the significant markup



over the 620, and more than double the price of a 520 or Huawei Ascend W1? Enough with all the rhetorical questions — join us as we find out exactly what the Lumia 720 has to offer.

HARDWARE

We've taken quite a liking to the design philosophy Nokia has carried through its Windows Phone 8 range to date, and the 720 is further proof the company has a good eye. A simple, clean rectangle, the handset measures 127.9 x 67.5 x 9mm (5.04 x 2.65 x 0.35 inches), making it one of the thinnest WP8 offerings. It shares obvious traits with HTC's 8X and Huawei's Ascend W1, which have the same sharp angles that feel like a tangible manifestation of Microsoft's Live Tile UI. While its hard lines give the 720 an air of sophistication, Nokia hasn't forgotten to add that playful Lumia flair. The round edges of the device balloon ever so slightly from the single piece of sculpted Gorilla Glass 2 that covers the entire front face, before tapering inwards to the flat back. The corners, sides and back are all one piece of polycarbonate, which in our case was red. Well, mostly red — it has a nice two-tone effect (albeit subtler than the 620's dual-shot color shells) that causes it to glow with more of an

Nokia hasn't forgotten to add that playful Lumia flair.

orange hue when brightly lit. There are also models bearing the other familiar Lumia colors of cyan, yellow, white and black, but here in the UK, the 720's currently exclusive to O2 in red (although our review handset came unlocked from Nokia.)

Those rounded edges serve as a buffer to the sharp overall aesthetic and, along with the flat back, make for a really comfortable hold. The grippy polycarbonate shell helps keep it anchored in the palm, and at 128 grams (4.5 ounces), it's deceptively light for such a solid-feeling handset. It may not be forged from metal, but build quality is robust and gives the 720 a premium vibe. In terms of footprint, the 720 is just shy of matching Samsung's Galaxy S III, despite having half an inch less of display on the diagonal. That said, the 720 doesn't look or feel like bloated hardware around a small screen — there isn't an excess of bezel to the left or right of the panel and all other space is allotted proportionally. Also, your thumb won't have any trouble getting where it needs to go.

Now, gather round for the tour. Joining the 4.3-inch display under the Gorilla Glass 2 sheet that consumes the 720's face are the standard back, home and search capacitive keys. Above the screen, you'll find a small, grey Nokia logo below the earpiece, with the 1.3-megapixel front-facing camera just to the left. The bottom edge is home to a micro-USB port and mic, while the





A Carl Zeiss-equipped camera still handles main photo duties.

left side is bare apart from the microSD drawer at the earpiece end. On the top edge are a 3.5mm headphone socket and another drawer for the micro-SIM, with the volume rocker, power button and two-stage camera button in Nokia's standard layout on the right-hand side.

The back panel is as clean and understated as the rest of the device. Up top is the 6.7-megapixel main shooter with a small flash off to its left and tiny black Carl Zeiss branding below it. In the center is a black Nokia logo embossed lengthwise into the body, and at the bottom-right corner is a subtle rounded-square loudspeaker grille.

Towards the middle of the bottom lie three round, metallic pads, which, when paired with an optional cover, grant the 720 Qi wireless charging for its sizable 2,000mAh, non-removable battery. In the right lighting, you can see the dark innards, which spread upwards from the three points on the bottom to envelop the battery. Committing halfway to wireless charging and requiring additional hardware to utilize it are curious design decisions, and it feels like an unnecessary inclusion.

Right at the bottom of the back panel is a glossy CE mark (a European certification) with Model: 720 Made in China in almost illegibly small font be-



SPECIFICATIONS	NOKIA LUMIA 720
DIMENSIONS	127.9 X 67.5 X 9MM (5.04 X 2.65 X 0.35 INCH)
WEIGHT	4.5 OZ. (128G)
SCREEN SIZE	4.3 INCHES
SCREEN RESOLUTION	800 X 480 (217 PPI)
SCREEN TYPE	IPS LCD, CLEARBLACK, SENSITIVE TOUCH
BATTERY	2,000MAH LI-POLYMER (NON-REMOVABLE)
INTERNAL STORAGE	8GB
EXTERNAL STORAGE	MICROSD (UP TO 64GB)
REAR CAMERA	6.7MP, BSI, F/1.9, CARL ZEISS LENS
FRONT-FACING CAM	1.3MP, F/2.4
VIDEO CAPTURE	720P (FRONT AND BACK)
NFC	YES
RADIOS	GSM (850 / 900 / 1800 / 1900MHz)
WCDMA (850 / 900 / 1900 / 2100)	V4.0
BLUETOOTH	V3.0 WITH EDR, A2DP
SOC	QUALCOMM SNAPDRAGON S4 PLUS (MSM8227)
CPU	1GHZ DUAL-CORE
GPU	ADRENO 305
RAM	512MB
WIFI	DUAL-BAND, 802.11B/G/N
WIRELESS CHARGING	YES (WITH OPTIONAL CASE)
OPERATING SYSTEM	WINDOWS PHONE 8

low. Unfortunately, this looks altogether messy on what’s otherwise a tidy handset. Continuing with the nitpicking, the spring-loaded microSD and micro-SIM drawers sink into the body a trifle (i.e., they don’t sit flush with the edges), and we were able to force a slight wiggle from the cage on our model. While the phone as a whole is definitively inflexible, the center of the back panel gives ever so slightly when squeezed, producing a light cracking sound — this is more of an observation and not something for concern. Highlighting such minor issues should give you a hint as to what we think of the hardware design in general. We like it... we like it a *lot*.

DISPLAY

Let’s get the specs out of the way first: 4.3-inch IPS LCD with ClearBlack technology and Sensitive Touch, 800 x 480 resolution, 217 ppi. What the makers of flagships with HD screens don’t want you know is that WVGA is still a pretty common resolution, especially for Windows Phone 8 devices. In fact, the 520, 620, 720, 820, 8S and Ascend W1 all have 800 x 480 displays



between 3.8 and 4.3 inches in size. We could reason that WVGA screens, and the resources needed for them, make for more affordable smartphones; or, that the Live Tile-based WP8 landing screen and all-around minimalistic UI render wonderfully at this res. But, if you lost interest after seeing 800 x 480, here's our Hail Mary elevator pitch: it's kinda awesome.

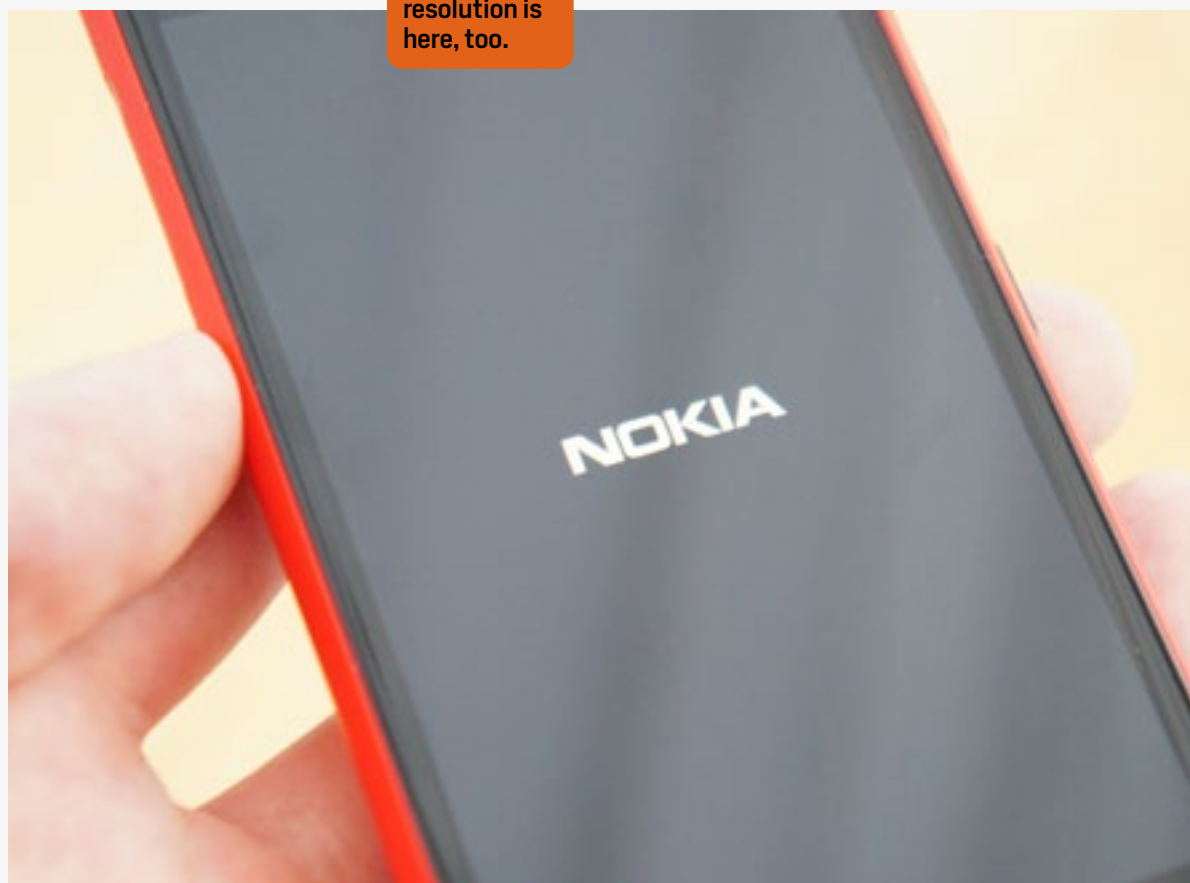
Pixelation in apps and menus isn't really an issue. It's there to some extent if you look hard enough, but the WP8 UI helps disguise it. We're surprised there isn't a noticeable drop in quality when compared with the Lumia 620's screen, which crams the WVGA resolution into its smaller 3.8-inch panel (246 ppi). Colors are rich and vibrant; whites are accurate; and blacks rank among the best we've seen, helped by Nokia's ClearBlack technology. The black of the screen is often indiscernible from the darkness of the bezel, making the entire front face look like it's supporting the Live Tile grid. Viewing angles, outdoor visibility, brightness (and the auto-adjust setting) are all great. Color us impressed, but we can't totally overlook the resolution. Whether from lo-

cal files, YouTube or Netflix, it's a perfectly adequate screen upon which to watch moving pictures (the loudspeakers have a bit of punch, too), but you know you're missing out on those finer details. This would also be the case for games, but those with more advanced graphics aren't compatible with handsets rocking 512MB of RAM.

SOFTWARE

You're probably well aware by now: the Lumia 720 runs Windows Phone 8. You can check out our full review of the latest version of Microsoft's mobile OS, but let's break it down briefly. WP8 is stripped back and simple. Beyond the lock screen is your Live Tile home screen and, on an adjacent panel, is a list of all your apps and core features like settings, messages, emails, *et al.* It's really easy

Like other WP8 devices, WVGA resolution is here, too.



Because this is a Lumia, you've got access to a bunch of exclusive apps.

to get the hang of, and Microsoft has built an OS that runs great on hardware that Android handsets laugh at. The OS is a major, if not *the* deciding factor when considering new handsets, so pondering whether WP8 is right for you isn't wasted time. On WP8, you're basically tied to Internet Explorer, so be ready to invest some time in moving those bookmarks across if IE isn't your default browser elsewhere.

Once you're all set up, though, WP8 is relatively transparent, easy to navigate and a cinch to understand. Our handset came straight from Nokia, so it was just a case of uninstalling the *Angry Birds Roost* pseudo-store to rid it of bloatware. Because this is a Lumia, you've got access to a bunch of exclusive apps not available on other Windows Phones, such as Photo-Beamer, Nokia Music and Pulse messenger (currently in beta). There is also a host of imaging apps that afford you advanced features not available within the stock camera software: Cinemagraph, Creative Studio, Glam Me, Panorama and Smart Shoot. Several of these and Nokia's Here navigation aids come pre-installed on the 720, with any omissions easily downloadable

from the software store.

Of the Here apps for the 720, only City Lens is exclusive to Lumias. Curiously, Here Drive+ beta, which is bundled with the arguably lower-end 620, doesn't make an appearance. Instead, you get Here Drive (available on all Windows Phones) — a satnav app that is limited to the country your micro-SIM is allied to. Drive+, on the other hand, is global, and considering the 720 is launching at a relatively high price point for second-tier WP8 phones, its absence feels a little cheap on Nokia's part. You've also got to remember that the 720 lacks support for a handful of apps by default, due to RAM requirements. But, at least the Twitter client is slick, right?

CAMERA

The 720's rear-facing camera is one of the main components that sets it apart from other WP8 models with otherwise similar core specs. While the 520, 620, 8S and Ascend W1 all have five megapixels to work with, the 720 has a 6.7-megapixel BSI sensor, Carl Zeiss lens and f/1.9 aperture. Before we get to that, though, let's take a quick pass over the 1.3-megapixel selfie shooter on the front face. The wide-angle lens with f/2.4 aperture is capable of taking some crisp and well-colored photos in daylight (read: good conditions), but starve it of light or bring it inside and the resulting pictures are extremely noisy. Under artificial light, you can see the exposure compensation stuttering in





Our best
shots came
in the Lumia
720's auto
mode.

the viewfinder as it struggles to adjust.

Shooting 720p video on the front-facer results in much the same experience. If you're inside or caught by failing light, it's going to be just like the stills: grainy. In favorable conditions, video exhibits an acceptable frame rate and quality, but has a tendency to radically shift white balance if filming on the auto setting, making for inconsistent clips. Let's be honest: front-facing cameras aren't selling points. You're not going to be overcome with disappointment when using it for the odd video call or self-portrait. Nokia's Glam Me airbrushing / filter app specifically for front-facing shots comes pre-installed on the 720, so there's that to play with.

Like most touchscreen handsets, you can tap on the screen to direct focus and take a picture, but, as with all Windows Phones, there's a physical, two-stage

camera button available to focus the main camera before shooting. We found this toggle a little too sensitive on other review handsets, but that's not the case on our 720. The two levels are clearly defined, so no frustrations there. Shutter response, however, leaves a lot to be desired. It takes a good two seconds for the lens to focus, the picture to be taken and the saving animation to finish before you're ready for the next close-up. It's pretty painful, and a steady hand is essential during the sluggish process to avoid filling a microSD card full of blurry shots.

If you're unfamiliar with the core WP8 camera app, it's pretty basic with only a handful of settings for both picture and video modes: scene type, ISO, exposure, white balance and aspect ratio. Within the subsections, there are



Shutter response leaves a lot to be desired.

limited options and we only strayed from automatic settings to shoot in low light. On the viewfinder screen, you can set the flash type, switch between cameras and toggle still / video modes, as well as access the other photography apps. There aren't any advanced features in the core app like HDR, burst capture, panorama, slow-motion video, etc. To get at these, you're kicked out of the standard camera interface into discrete apps, with loading screens in between. We've got Cinemagraph, Glam Me, Panorama, Smart Shoot and Microsoft's Photosynth app installed. Panorama is a solid app that's easy to use and does a great job of stitching snaps together, even if exposure sometimes varies across the canvas. Smart Shoot is Nokia's take on the burst-capture mode, but the app can't improve the shutter lag on the 720, so it's only slightly quicker than taking a couple of regular shots in succession.

So, how about that 6.7-megapixel, Carl Zeiss lens camera round the back? Overall, we've got mixed feelings. When taking our sample shots, we didn't tinker with the settings much apart from selecting the appropriate scene type (night, close-up, etc.). Finding the best results came when we left the 720 to make up its own mind in auto. By do-

ing that, however, you're at the handset's mercy. Some shots came out crisp, with HDR-esque vibrancy and contrast, while others were dark or appeared to have all the color sucked out of them. Macro shots were agreeably consistent, by and large. Without the help of the sun, things got a little worse. Colors just weren't represented correctly in artificial light. With those bulbs turned off and given the right distance, the small flash kicked out enough rays to keep overexposure to a minimum. We don't expect you'll be using the flash that often, though, as the f/1.9 aperture and BSI sensor suck up every bit of light in dim conditions and made for some impressive snaps. We found some tradeoffs in quality, and the focus failed 50 percent of the time, but Nokia's low-light pedigree was very apparent here. It doesn't equal the low-light performance of the Lumia 920 by any means, but it's close enough for comparison, which is a good thing.

Video recording with the main camera (720p, 30 fps) isn't as good as stills in low light, but you do feel some of the benefit of that aperture and sensor. Daylight recording is smooth, but there's no complicated image stabilization tech to mask shaking. We've no qualms with sound capture, but will say the autofocus occasionally stuttered, and brightness wasn't particularly consistent throughout a recording. It's worth noting that video startup was around one second — half the time it took to snap a still.



PERFORMANCE AND BATTERY LIFE

There are two distinct classes of WP8 devices. In the higher tier are the likes of the 820, 920, HTC 8X and Samsung's ATIV S — with their fancy dual-core 1.5GHz Snapdragon S4 Plus / Adreno 225 GPU chips and 1GB of RAM. The 720, however, is in the lower tier, along with the 520, 620, and 8S, which share a common dual-core 1GHz Snapdragon S4 Plus with Adreno 305 GPU and 512MB of RAM, as well as 800 x 480 resolution. Huawei's Ascend W1 is a slight anomaly, falling into the lower bracket on most specs, but *its* S4 Plus is clocked at 1.2GHz. Like the 520, 620 and 820, the 720 has 8GB of onboard storage, expandable via microSD, with 7GB of free SkyDrive space, to boot.

As the benchmarks show, there's nothing to distinguish the 720 from its peers in the lower class. Not that

any difference was expected — it's the same SoC in a different outfit. What that means is there's nothing to really say about the 720's performance that hasn't been said of competing devices. It boots from dead to usable in roughly 30 seconds. You can jump right into the core features (messages, settings, etc.) in under a second, lighter apps such as Music+Video in three to four and heavier software like Nokia Music can load for upwards of five seconds. Nothing feels slow, mind. Anything that doesn't come up instantly will present you with a loading animation, so any shortcomings of the hardware are disguised by these fluid transitions — you don't see apps stutter into life, freeze on the screen or lag perceptively.

When subjected to the WPBench battery rundown test (it was still pulling emails over WiFi, too), the 720's

BENCHMARK	WPBENCH	BATTERY RUNDOWN	SUNSPIDER (MS)	ANTUTU (*GFX TEST OFF)
LUMIA 920	227	2:36	914	10,957*
LUMIA 820	224	2:07	909	11,506
LUMIA 720	179	4:36	1,440	7,348
LUMIA 620	180	3:41	1,443	7,479
LUMIA 520	178	2:41	1,400	7,350
HTC 8S	180	3:30	1,415	7,333
HTC 8X	221	2:30	914	11,775
SAMSUNG ATIV S	241	2:38	890	12,064

SUNSPIDER: LOWER SCORES ARE BETTER.



2,000mAh battery lasted over four and half hours. It's by far the biggest power pack in any of the 1GHz WP8 handsets, with its closest rival being the 1,700mAh cell that powers the 8S (although the 620's 1,300mAh battery beat the 8S in the rundown test). Its triumph in testing is reflected in normal usage. You can get a day of heavy use out of it, but under normal circumstances, it should be good for 36 hours without needing a top-up. With the charger included in the box, it refuels at a rate of approximately 50 percent per hour.

We would like to try out some games that push the 720's hardware to its limits, but as previously mentioned, we don't really have that option with only

Apps are starting to crop up with a minimum requirement of 1GB.

512MB of RAM. Apps are starting to crop up with a minimum requirement of 1GB. The 3D racer *Asphalt 7: Heat*, *Modern Combat 4* and Nokia's own Xpress cloud-compression browser are on this list, as is the recently released original *Temple Run* — hardly the *Crysis* of mobile gaming. As Microsoft's platform is maturing, we can only assume the 1GB requirement is going to become more commonplace. Hopefully,

Windows Phone 8.1 will be 512MB-compatible, or a lot

The 720 keeps up the dapper aesthetics of Lumias past.



of people are going to be disappointed.

Internet browsing is snappy on the handset, both for mobile and desktop sites. Zooming is done quickly, without lag, and when backing out, it takes only a moment to fill back in what was cropped out. It's quite hard to fault, really. To access the web, you'll be using WiFi, which maintains a solid connection at a distance, or over HSPA+ at up to 21.1 Mbps when out and about. Sorry, there's no LTE chip, which is a bit of a faux pas in the States and is becoming increasingly more relevant in the UK. The radios are good for GSM (850 / 900 / 1800 / 1900MHz) and WCDMA (850 / 900 / 1900 / 2100MHz) networks.

In other miscellany, audio quality through headphones is rich and well-balanced (although not quite as good as the iPhone 4S), but don't turn it up too loud, because it *will* go up to 11 — or 30, to be exact. The loudspeaker will bring the noise, too, albeit low-quality noise. Call quality is sharp; GPS lock-on is basically instantaneous; and Bluetooth connections are solid when the 720 eventually finds whatever peripheral you're trying to pair it with. Using NFC to partner with

a 620 for beaming a photo sped up the process significantly.

THE COMPETITION

We're really struggling to find *the* hook which sets Nokia's Lumia 720 apart from all the other handsets with similar specs, so let's look at its positioning in the UK (note: there's no sign of any US carriers picking it up). O2 has been on a rampage, picking up practically all the WP8 devices we've mentioned throughout this review, and they're all available on PAYG to make the comparison a little easier. HTC's 8S costs £170 (\$260); the 620 is £150 (\$229); the 520 is £120 (\$183); and Huawei's Ascend W1 is

The 720's price tag may be its biggest deterrent to adoption.



merely £109 (\$167). The 720, however, is £300 (\$458) — in other words, not far off the price of three Wls, which carries the 1.2GHz S4 Plus.

WRAP-UP

Do the small perks afforded to the 720 justify that price? You get a slightly better shooter than all the other models, a bigger screen at the same resolution and peripheral-assisted wireless charging. The only real specification that excites us is the longer battery life, but we're all now accustomed to the nightly charging ritual, so we're not convinced it's worth the price hike. We can't exactly ignore the extras — each has their own cost, and we understand



Outdated internals make stellar design less attractive.

it adds up. However, it would make more sense to ditch the half-baked Qi integration and upgrade the RAM instead. We get the appeal of the 520: it's entering as the cheapest way to get that colorful Lumia style. We imagine Nokia's attempting to place the 720 as a mid-range

device, but what's fundamentally wrong with the handset is that it represents slowly aging hardware in a pretty dress, with a few catchy slogans attached. **D**

Edgar Alvarez contributed to this review.

Jamie Rigg is a Contributing Editor at Engadget, and a total sucker for any tech he really doesn't need.

BOTTOMLINE

NOKIA LUMIA 720 £300 PREPAID (02, UK)



PROS

- Attractive design
- 2,000mAh battery
- Good low-light pics

CONS

- Aging innards
- Relatively expensive

BOTTOMLINE

Nokia's Lumia 720 is a very desirable handset on the outside, but lackluster insides make it hard to justify the price.



ASUS CUBE



Can **ASUS' Cube** win over your Google TV set-top allegiance by the merits of its unique design and remote control?
By Ben Drawbaugh

The past year has been a busy one for Google TV — in fact, with the big I/O conference right around the corner, we're sitting down to review our *fifth* such device in the past 12 months. The ASUS Cube naturally does everything one would expect from a Google TV set-top box, but it also has a few tricks of its own, like a mic for voice search and a unique “Cube” main menu interface. At \$129, it's priced just above the Vizio Co-Star and far below the Sony NSZ-G57. So how does it stack up? Let's see.



HARDWARE

Obviously, when you name your device after its shape, your intent is to draw attention to what you believe is a unique differentiator, so let's start there. The ASUS Cube is, of course, a cube, with every edge measuring just under five inches. Judging by the fact that it is bottom-heavy, we suspect the top half of the device is empty and wonder why the extra space wasn't used to house an internal power supply — but we do appreciate the decision to go with a power-brick style over a wall wart.

Like every Google TV, there are two HDMI ports so you can pass through your

cable or satellite provider's set-top box and share the coveted input-one. That's the only audio or video output, though; there aren't any for older TVs or even a digital audio out for those without a free HDMI port on their AV receiver. There's also a USB port on the front and one around back, which you can use for external storage or to quickly watch content off a flash drive. The 10/100 Ethernet port is readily available for those lucky enough to have a wired connection near the TV, while 802.11b/g/n should handily suffice for everybody else. The last port to speak of is for connecting an IR emitter, which comes

The Cube only offers HDMI ports for audio output.



in the box and is required if you wish to control your TV or AV receiver via IR using the Cube's remote, which doesn't emit IR on its own. This is useful, no doubt, but we do wish the Cube included internal IR emitters too, especially after seeing how well the Logitech Revue's integrated IR system works.

Inside, the Cube shares the same Marvell Armada 1500 chipset as its more recent Google TV competitors. Although there's technically 4GB of flash storage, only 2GB are actually available for use. The HDMI port supports just about every HD resolution and frame rate you might want, but there's no mention of 4K. It's also able to natively pass the Dolby Digital Plus signal from the likes of Netflix and Vudu if your AV receiver can accept it. The last trick the HDMI port features, that we are always pleased to see, is the inclusion of HDMI-CEC. Basically, this enables the TV and receiver to automatically turn on or off when the Cube does with more reliability than IR can provide, but volume control via CEC wasn't something we were able to test.

REMOTE

In contrast to most home theater gear, where you don't even put batteries in the included remote and use a universal remote instead, the remote that comes bundled with a Google TV box isn't easily replaceable. We're happy to report, though, that the Cube's remote

makes the box stand out in a good way. The overall fit and finish is solid thanks to a grippy texture, solid feel and well-placed buttons. The highlight, however, is the trackpad located on the opposite side. It performs reliably as a pointing device and you can quickly toggle it into a push-button d-pad (via an accessible button on the side) for standard up-down-right-left navigation. The good news, if you can call it that, is that the trackpad works so well that you really miss it in apps that don't support point-and-click, like Netflix. The other miss here is the lack of a backlight, which you'll find on

The remote offers QWERTY and trackpad input control.



at least one other Google TV box.

The remote does stand out in another way that ASUS is happy to point out — no, not motion-control gaming, the Vizio Co-Star has that as well — it features a mic and buttons to activate Google's Voice Search. The Hisense Pulse also features a mic, but previously only the LG G2 Google TVs could use the remote's mic for Voice Search. This worked as you might expect — so no, not perfect. We had to have the remote a little closer to our mouth than we might normally prefer.

Overall the remote is a reason to buy the Cube, and aside from some range problems we had when trying to use the keyboard, we really like it. That said, it isn't the be-all, end-all remote and the lack of macros will mean you'll probably keep your programmable remote around.

SOFTWARE

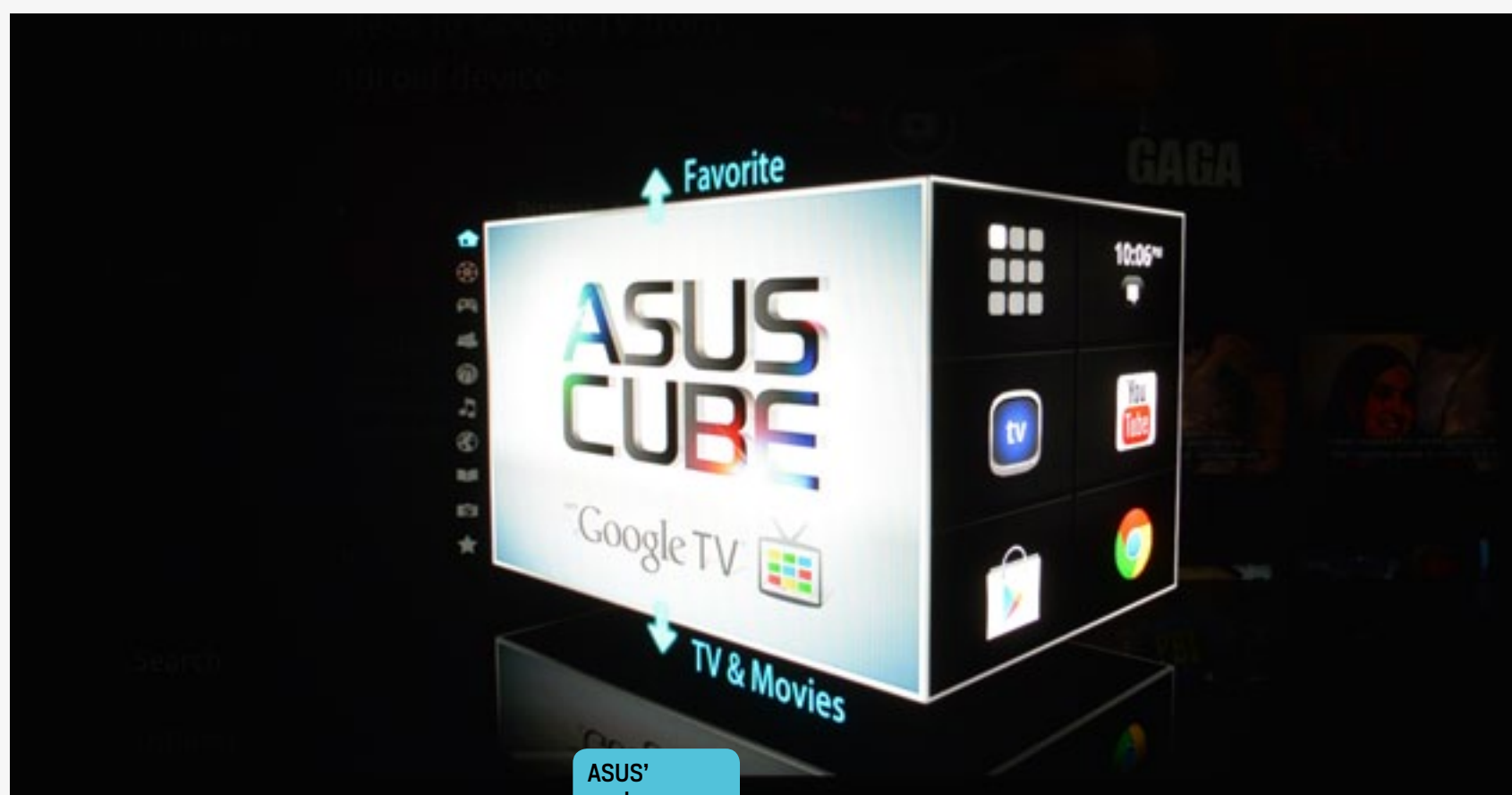
The Cube's name doesn't only describe the box's shape; it also covers the design of the main menu. The user interface is a three-dimensional hexahedron with only two sides exposed. The left side is used to indicate which of the 11 main sections is currently selected (Favorite, Photo, Education, News, Music, Sports, Social, Games, TV & Movie and Home) and the right offers up six sub-menus to drill into. We suppose this will be a matter of personal preference, but this particular editor isn't a fan. Overall, you're left with a bunch of white space and a less-than-awe-in-

The Cube is a solid Google TV set-top box, but it isn't going to change anyone's mind about Google TV.

spiring effect. Happily, though, you can easily select the All Apps tile from the Home menu and still have access to the familiar Google TV grid of applications. At least the box has the power to pull off the fancy menus without any noticeable slowdowns, though.

Speaking of applications, the typical offerings from Google are here, including HBO Go, Netflix, Chrome, Google Play, Google Music and PrimeTime. But ASUS does add a few of its own to distinguish the Cube. The two most notable, and perhaps unique, are the Whiteboard to turn your TV into a huge collaboration device, and ASUS Web Storage, which comes with a free 50GB account for easily accessing your content in the cloud. Some of your media is probably still hanging around the house and so ASUS also included apps for accessing your movies, music and photos. These can grab content via DLNA, FTP, SMB or an external, USB-attached hard drive — most typical codecs and containers are supported, but check the full list on the support site to be sure your favorite is there. The last app you won't have to hunt for on the





Play store for is a task killer, as one is included too.

ASUS has done a good job of setting the Cube apart from its Google TV competitors with its software — again, judge the Cube user interface yourself — but at the end of the day, it's still Google TV 3.2. So all the good (and bad) things we've said about it previously still apply here. The only other bit we'd add is that there should be a screen saver or dimmer feature for those with displays susceptible to burn-in. Also, other Google TV boxes have done a better job adding menu overlays to facilitate multitasking while in apps (the Vizio Co-Star's App tray comes to mind).

WRAP-UP

From the very beginning, Google TV has offered the best browser experi-

ence for televisions, but a good browser experience alone can't win over mainstream consumers. In almost three years, Google has continued to iterate its TV offering through both software and hardware (via partners). The Cube has a strong place in that lineup, bringing new features and a competitive price. Sure, the Vizio Co-Star is still less expensive, but the Cube's remote is closer to that of the much more expensive Sony NSZ-G57's in both ergonomics and usefulness. The added software from ASUS will surely help set this device apart from the competition, but the Cube interface? Not so much. In the end, the Cube is a solid Google TV set-top box, but it isn't going to change anyone's mind about Google TV. More than anything, though, our biggest hesitation in recommending the Cube is a matter of timing. With Google I/O right around





Google TV gets a new home in this unique Cube casing.

the corner, we can't help but worry that the time to buy a new Google TV isn't now. **D**

Ben Drawbaugh is Associate HD Editor at Engadget, an HD snob, father, car guy and mountain biker.

BOTTOMLINE

ASUS CUBE

\$129



PROS

- Mic built into the remote for voice search
- Good implementation of Google TV
- Solid trackpad on the remote

CONS

- A Cube doesn't fit well in a home theater
- Limited audio and video outputs
- The Cube user interface isn't great

BOTTOMLINE

It's the best Google TV set-top box yet, at a reasonable price.



SAMSUNG GALAXY S 4



The **Galaxy S 4** has improved on its GS3 predecessor in almost every way, but is it enough to keep ahead of the competition?
By Brad Molen

This is the story of a little smartphone series that grows up and, three years later, positions itself to take over the world. The device in question, the newest addition to that lineup, doesn't really need much of an introduction thanks to some of the most successful marketing campaigns in the world. We'll be happy to give it anyway: pictured atop this very text sits the Samsung Galaxy S 4, the latest and greatest flagship out of Korea. This is the hero, the device chosen to lead the charge for Samsung as it ventures deeper into 2013, and it's fitted with



the best of everything: a 1080p Super AMOLED display, 1.9GHz quad-core (or 1.6GHz Exynos 5 Octa 5410, depending on market) chipset, Android 4.2, 13-megapixel camera and a wide assortment of brand-new firmware amenities, to name just a few.

Despite the fact that its predecessor sold millions upon millions of units in the past year, the Galaxy S 4 isn't alone in its quest for global Android domination this time. HTC, the underdog of the fight, has launched the One, a flagship that rivals the GS 4 in almost every way and does so in a physically attractive package complete with a solid aluminum build. Where do these two devices stand in comparison to each other? Does the GS 4 reign supreme? Will its onslaught of new software features send the phone to the top of the pack?

HARDWARE

If your first impression of the Galaxy S 4 was like ours, we're guessing you had a hard time differentiating it from last year's flagship model. Take a closer look, however, and it becomes more apparent that Samsung's design team didn't actually use the past year to catch up on the sleep it lost crafting the GS3. The

phone maker kept to the same overall style, but it made a few crucial tweaks along the way to improve its fit and finish.

Samsung's choice of build material wasn't one of them. If you were a critic of the GS3's plastic construction, you'll be disappointed with its successor — the company's continuing its long-standing tradition of keeping metal out of the assembly lines, building the frame, back cover and faux-chrome edges with polycarbonate. It's similar — though lower-grade and not machined — to the type of plastic you'd enjoy on flagships like the Nokia Lumia 920 or even the HTC One X+, so it's nothing out of the ordinary for Samsung. The biggest benefit in using this type of material is that it offers a little more give when you drop the phone. It's still plenty sturdy, and

The GS 4 retains the same plastic exterior as the GS3.



The GS 4 uses polycarbonate and is pretty sturdy, but the HTC One still has a more premium build quality and visual appeal.

it feels like it's just as durable as the GS3 or Galaxy Note II. This may be ideal for a large number of potential buyers, but we still prefer the HTC One's premium build quality and visual appeal, thanks to its use of high-grade aluminum through its entire unibody chassis.

One of the subtlest tweaks to the design in the GS 4 may also be one of the most effective: the Gorilla Glass 3 rests just a hair below the edge of the screen. This tiny move makes the screen a tad less vulnerable than the GS3, which features glass that sits slightly above the edge. This won't guarantee your screen's safety when you drop your phone, but it at least increases the likelihood of it surviving an impact at an angle.

Another design shift is in Samsung's choice of decor. At launch, the GS 4 will be offered in Frost White and Black Mist, and both colors feature a cross-stitching pattern across the front and back. This style is sufficiently subtle on our white review unit and even adds a little personality to an otherwise glossy

device. It stands out more on the black model, however, to the point where it's a bit of an eyesore. When it comes to comparing the darker-hued versions, we much prefer the brushed-metal look on the blue GS3. (In full disclosure, we've spent far more time with the white unit, so our views of the black version are based on first impressions we had prior to our review.)

Although it technically has a larger display than its 4.8-inch predecessor, the 5-inch GS 4 is actually narrower (69.8mm wide, versus 70.6mm on the GS3) because it only adds vertical screen space and has skinnier bezels on each side. The GS 4 loses most of the well-polished curves prominently featured in the past-gen flagship, as it's designed with broader corners and a filled-out back, both of which are signs that Samsung has veered away from its "inspired by nature" mantra. Fortunately, this means we finally get to say goodbye to the pebble look and feel: the edges are straighter from top to bottom, giving our fingers more surface to grasp onto, and the back cover fits flat on the faux-chrome edge instead of curving around it like waves of the ocean. The entire surface is still slick and glossy, but even so, it's still easier to wrap your hands around this device. Measuring 7.9mm (0.31 inch) thick, the Galaxy S 4 is 0.7mm (0.027 inch) thinner than its older sibling. It's also a mere three grams (0.11 ounce) lighter. All that said, the difference between the two devices



isn't noticeable unless you're closely inspecting the pair side by side.

Whereas the home button was almost completely flush with the rest of the body on the GS3, the S 4's is raised a fair amount. On one hand, physical buttons are much easier to press this way; on the other, it stands out above the rest of the screen so much that our fingers catch on it as we swipe down on the display. It's an aspect of the phone we can get used to, although it's unfortunate that its placement interrupts the design flow. As for the rest of the front side, the menu and back keys flank the home button on the left and right, re-

spectively, which is completely opposite of the layout used on a large number of OEM Android devices. Along the top of the screen, you'll see the 2.1-megapixel front-facing camera, earpiece grille and an assortment of sensors.

Flip the phone over and you're presented with a slightly raised camera module on the top with an LED flash just below, and a pair of slits over the mono speaker sitting near the bottom; the plastic between them is raised to prevent sound from being muffled when the phone is lying face-up. The obligatory logos are here as well: "Galaxy S 4," located just

The S 4 offers a 2,600mAh battery and microSDXC slot.

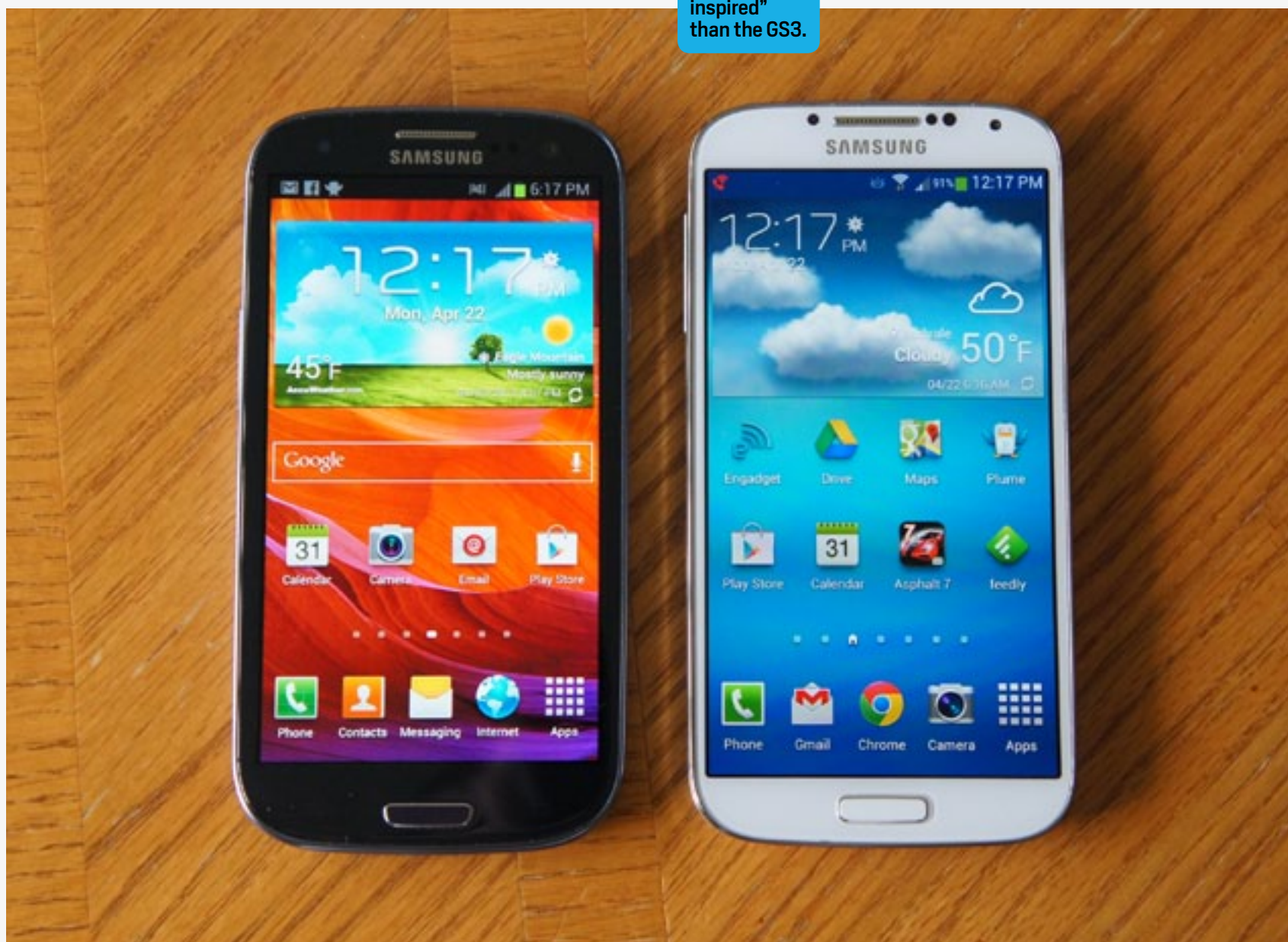


above the speakers in traditional fashion, and the carrier logo (T-Mobile in this case) underneath the flash.

Samsung prefers to make the back cover removable, meaning you have easy access to the 2,600mAh battery (which doubles as the NFC antenna), along with the microSDXC and micro-SIM slots — as well as contacts for inductive charging — just above it. We expect to hear more about the phone's wireless charging options from Samsung eventually, but all we know for now is that the company plans to sell an optional back cover with this capability built-in. (Given Verizon's interest in Qi, we won't be surprised if its version of the GS 4 launches with the option.)

Going around the faux-chrome edges, you'll find the volume rocker on the left, power button on the right, micro-USB / MHL 2.0 connection port on the bottom and the 3.5mm headphone jack, mic and infrared transceiver on the top. It's refreshing to see infrared resurging in popularity, as we're now seeing it in several flagship devices, though it's used in a completely different way now than in the days of the Palm Treo and other IrDA-clad devices. Which is to say, the primary reason for the tech used to be focused on data transfers and "beaming," and now it's simply offered as a universal remote.

The GS 4 is slimmer and less "nature-inspired" than the GS3.



DISPLAY

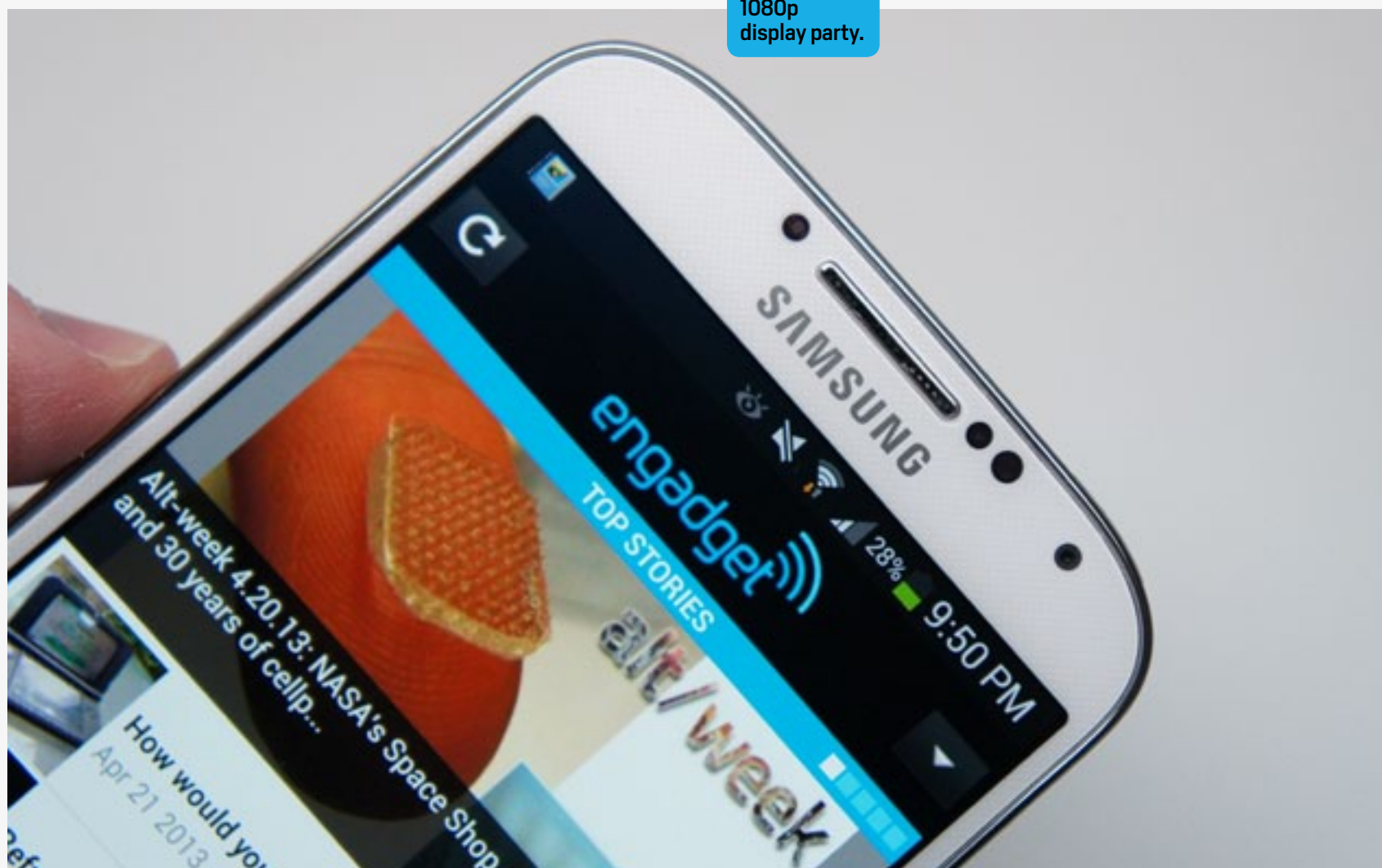
In the last two months, Sony and HTC have both released flagship phones, each with a spec sheet-topping 1080p display. Although both looked great on their own, the HTC One bested the Xperia Z in nearly every possible way. But now that Samsung is finally tossing its hat into the ring, will its 5-inch, 1080p Super AMOLED screen top the LCD used on its bitter rival?

In short, the two are incredibly close, and you'd probably be happy with either one. But let's dive into more detail about how they differ. AMOLED panels are generally more saturated in color than their LCD counterparts, but we were a little surprised to see the level of color toned down from the

The new Synaptics ClearPad in the GS 4 is capable of detecting your finger from 2cm away.

GS3; so much, in fact, that most images we viewed matched the natural color reproduction we enjoyed on the One. The blacks were still darker on the GS 4, while the whites were brighter — and viewing angles better — on the One. Blues looked the best on the GS 4, but the reds were a little too saturated for our taste. Yes, the world of 1080p smartphone displays is a nitpicker's heaven, but

Look who decided to join the 1080p display party.



unless you have an aversion to AMOLED panels, you'll be amazingly happy with the crisp text and vibrant visuals. Lastly, to make sure we avoid any confusion, it is indeed a clear improvement over the 720p display on the GS3.

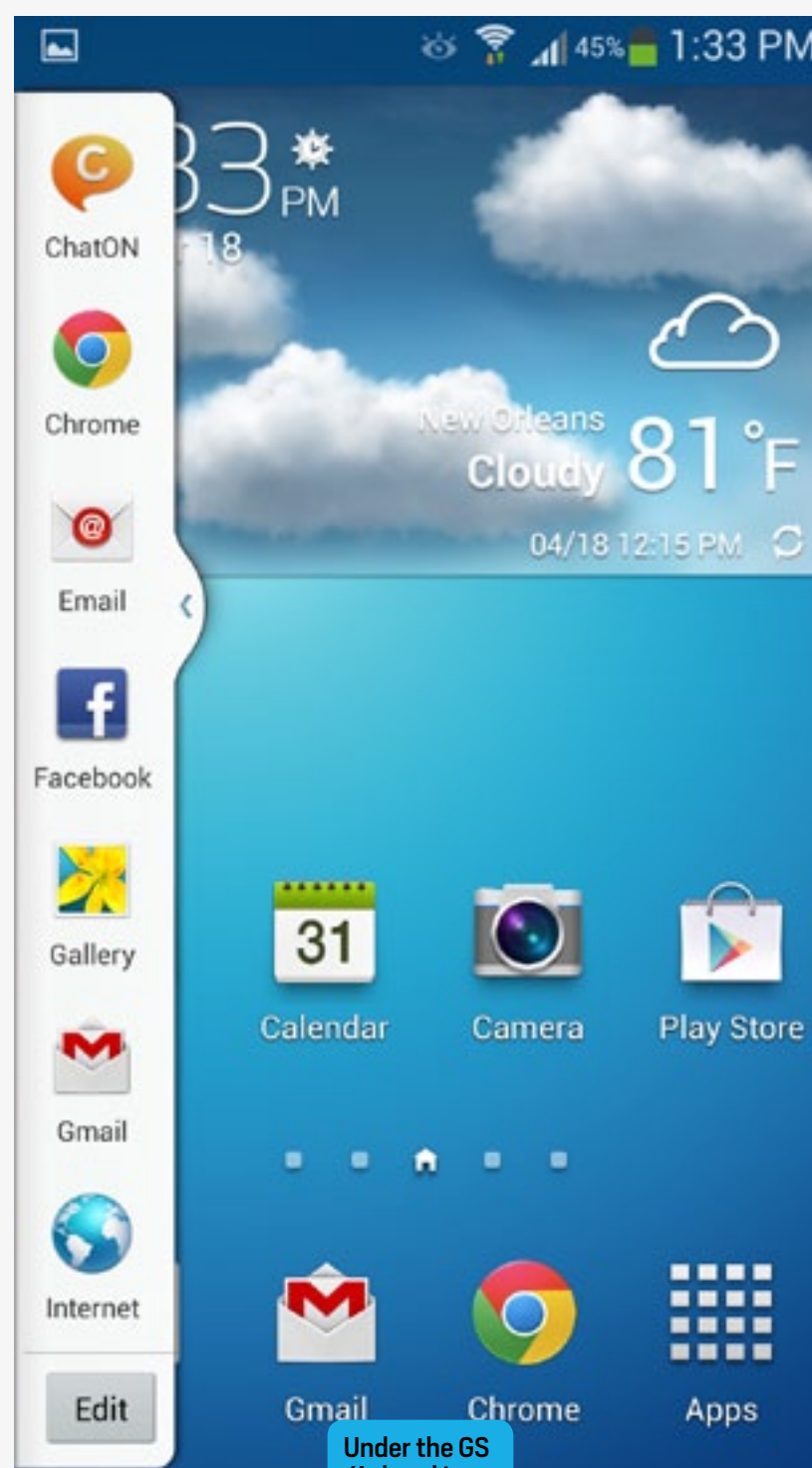
Additionally, the GS 4 uses an advanced capacitive touchscreen powered by Synaptics, also known as ClearPad. This particular screen features a new tech dubbed "3D-Touch" which gives the phone the ability to detect your finger from up to 2cm away. Not only does this make it possible to use Air View without an S Pen, it also allows cold-weather folk to touch the screen while wearing gloves if you've activated the "extra sensitivity mode" in the settings. (In case you're wondering, an S Pen won't work on the GS 4 due to the lack of Wacom digitizer, but we're told that the C-Pen and other capacitive styli should function perfectly fine.)

SOFTWARE

Despite the fact that Android received nary a mention in Samsung's GS 4 launch event last month, the device is actually one of the first smartphones (outside the Nexus 4, of course) to run Android 4.2.2 Jelly Bean, the most recent version of Google's mobile OS. Considering it was introduced nearly six months ago, this is a pretty huge deal — not to mention yet another scathing reminder of the lengthy waiting period Android fans endure between updates.

The GS 4 runs Android 4.2, which is still rarely used in brand-new devices.

Since the GS 4 uses Android 4.2, it offers many of the same additions introduced with the refresh — but not all. One feature that didn't make the cut is Photo Sphere, a clever camera option



Under the GS 4's hood is a Jelly Bean of the 4.2.2 variety.



that lets you stitch together panorama photos aligned both horizontally and vertically. You also can't use the stock Android keyboard, though Samsung's collaboration with SwiftKey is definitely an acceptable alternative. What you can do, however, is take advantage of expanded Google Now features, use the Daydream screen saver and pull down the notification bar with two fingers to access the quick settings notification bar. (In fact, Samsung's TouchWiz

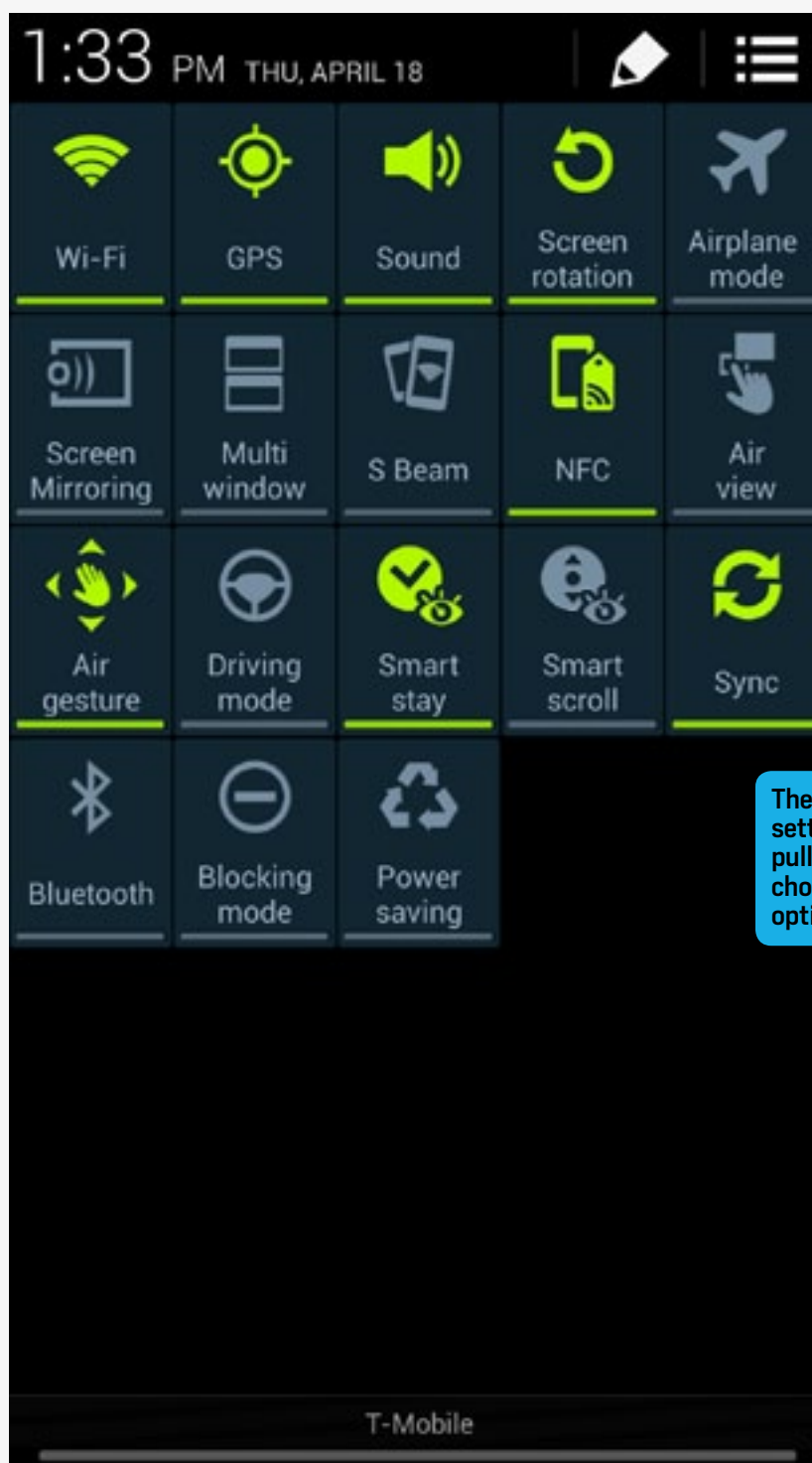
version boasts even more toggles to choose from in this menu, and you can customize the order in which they appear.) Lock screen widgets will also be at your disposal every time you wake your phone up — and Samsung has even developed a few of its own, such as widgets for WatchON, Samsung Music and a customizable grid of your favorite apps.

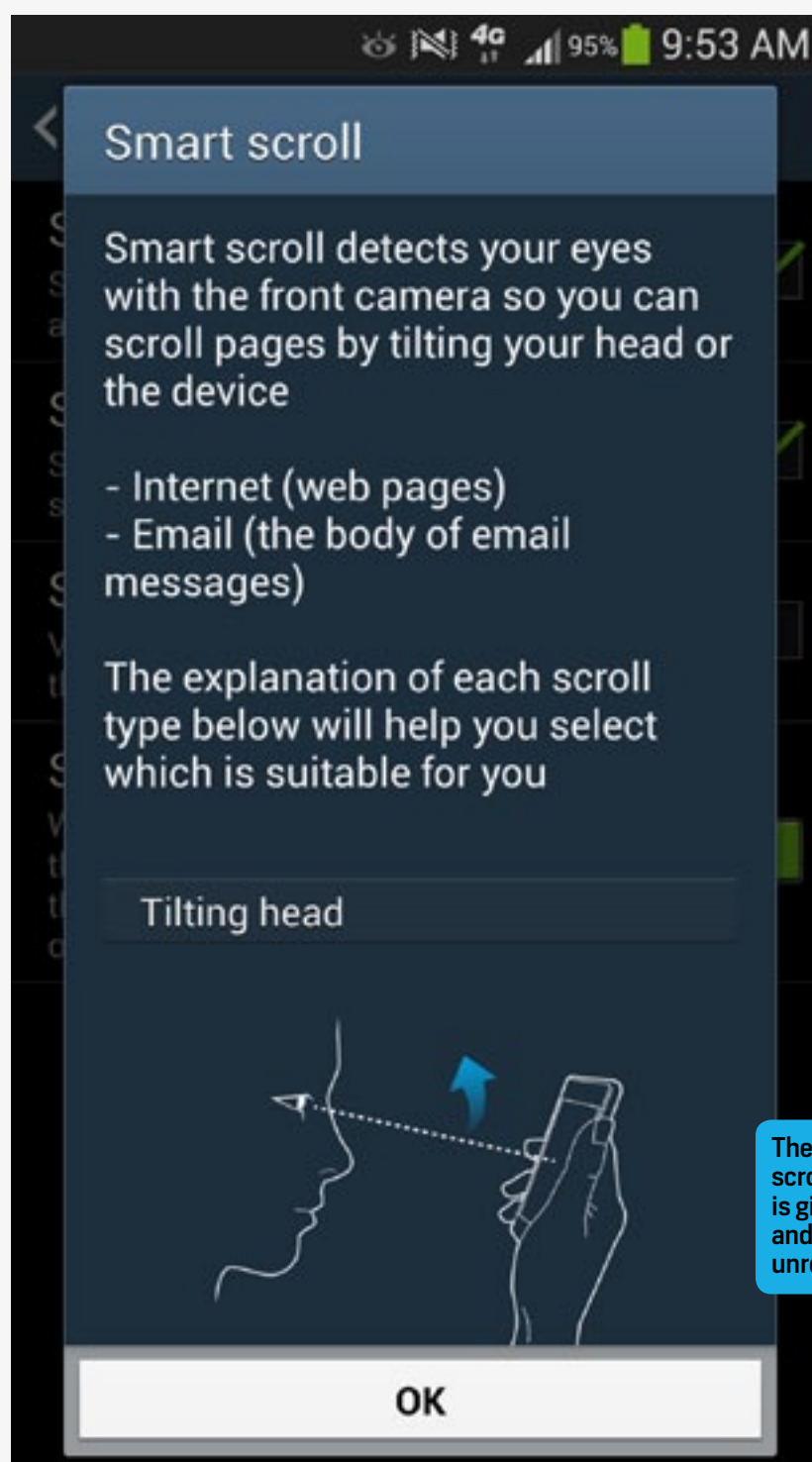
As is the mantra of every Galaxy device, the GS 4 uses Samsung's TouchWiz skin atop nearly every possible aspect of the firmware. And whether you love the proprietary UI or not, its overall layout is nearly identical to what you'll find on the GS3. You can still use up to seven home pages, and you're treated to the same app menu, options and gestures. Even the standard notification bar looks exactly alike. Samsung is a fan of consistency, and many TouchWiz enthusiasts will appreciate the minimal learning curve required to make the jump to this device. Simply

put: if you enjoyed the firmware on the GS3, your experience with its successor will be just as rapturous, if not more so. If you're hoping to run custom ROMs in place of TouchWiz, you may have to wait for a little while since Samsung has confirmed to us that the bootloader is locked.

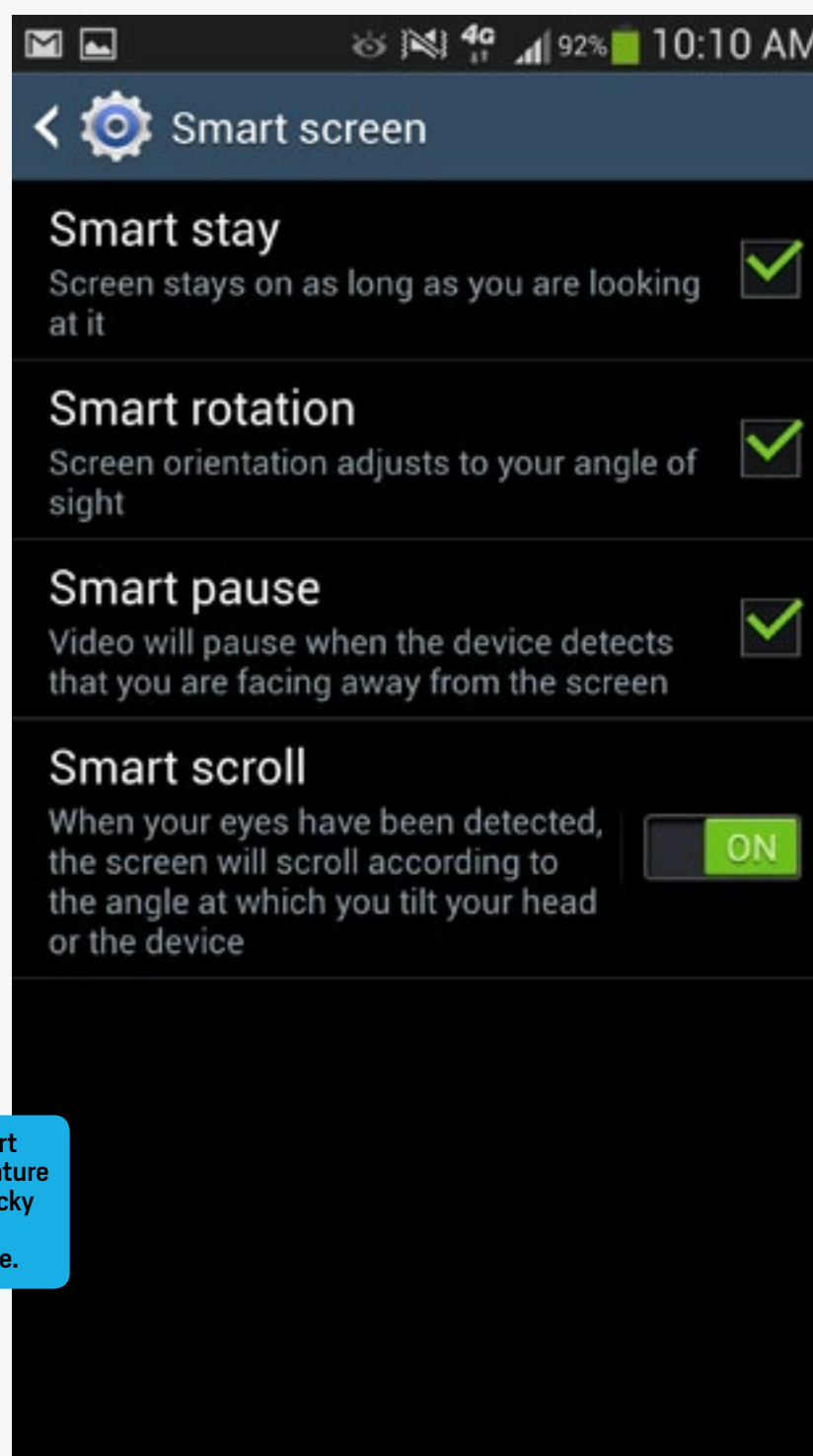
NEW FEATURES

With another flagship Galaxy device comes yet another wave of brand-





The Smart scroll feature is gimmicky and a bit unreliable.

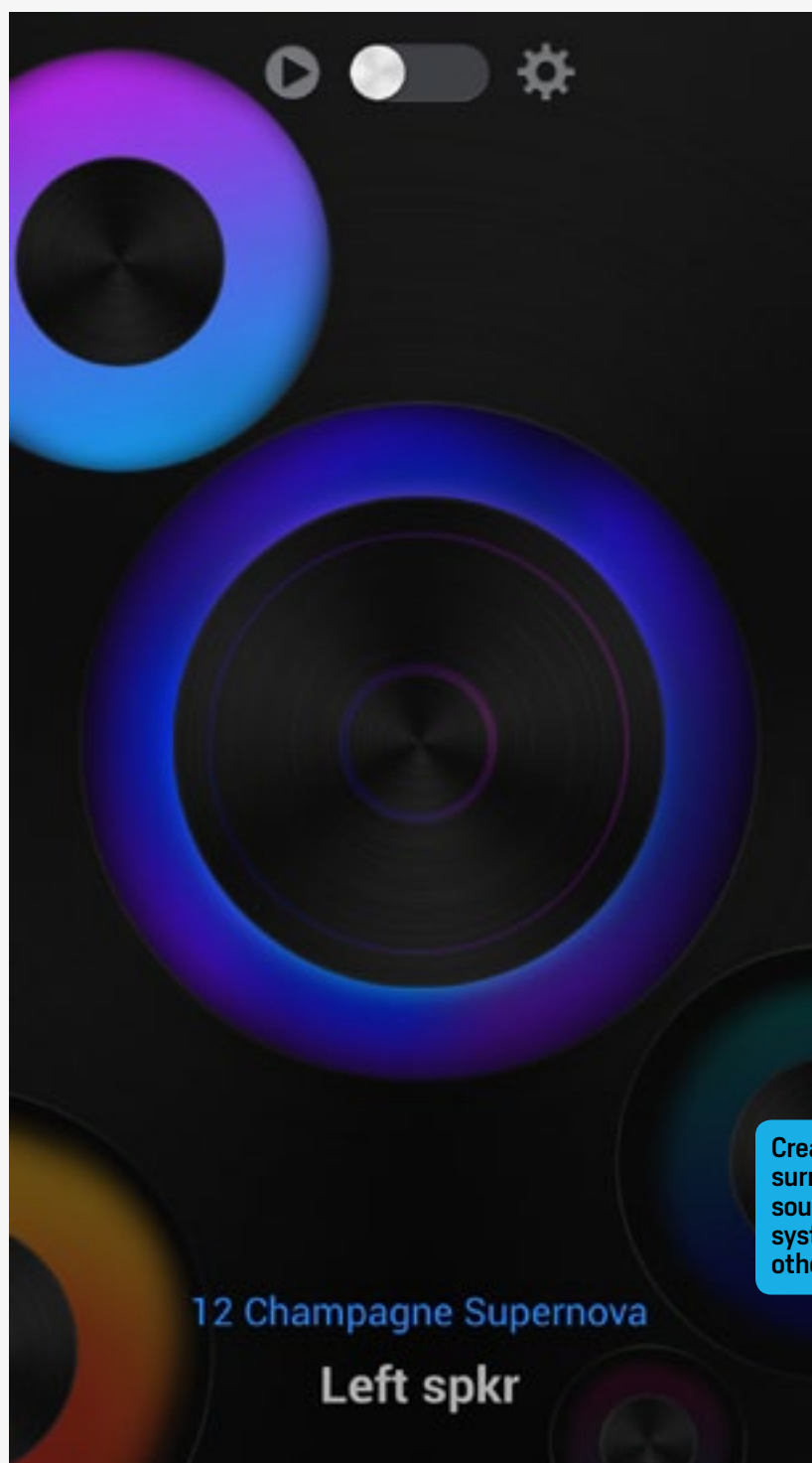


new software gimmicks perks. This shouldn't stun anyone who's already familiar with Samsung; the company's been cranking out onslaughts of new gesture- and motion-based features — alongside a variety of other apps and services — with each new version. Some are useful, but even more are simply party tricks that seem to be designed for their wow factor.

The feature that has arguably received the most attention is Smart

Scroll. The front-facing camera detects your eyes and then tracks the movement of your head, in much the same manner as most other Smart features. If you tilt your head down, the page you're looking at scrolls down; tilt your head up and the screen scrolls up as well. It's a great idea, in theory, but we ultimately found it frustrating for several reasons. First, it only works in specific apps. For instance, the stock internet browser supports it, but Chrome does





not, and we couldn't scroll through Samsung's menus using this method, either. (There's no word on whether this feature will be incorporated into an SDK eventually for third-party developers, but we're optimistic about it.)

Second, it won't work in a dimly lit area since it has to pick up your eyes. Third, your face can't be too close or too far away — you'll get the best results from between two and three feet away. We also grew quickly tired of

Smart Scroll is a fun idea in theory, but our neck got tired more quickly than our fingers when doing the same task.

bobbing our head up and down to do an activity we can easily do with a flick of a finger. Lastly, it doesn't always work as promised. In some cases, tilting your head up offers no results, regardless of how smooth or jerky your facial movements are. Other times, the screen scrolls down even when your face is out of the camera's line of sight. On several occasions, even, the screen simply stopped scrolling mid-page, despite the fact that we hadn't moved or blinked. (In full disclosure, we have only reviewed the T-Mobile model, so it's possible that the experience may vary on the unbranded GS 4. We will update this review if we find differing experiences with other models.)

Right up there amongst the highly touted GS 4 services is a feature called Group Play, a P2P networking tool that expands on the features introduced in Group Cast last year. In this mode, your phone establishes an ad-hoc Wi-Fi hotspot. When one or more GS 4 devices are within range, all of them can be connected to each other, giving them the



ability to share music, photos, docs and even games with each other. While sharing photos and docs in this fashion are par for the course, Group Play adds some interesting twists to the music and games arena. Instead of simply sharing the song with a friend, this feature lets each phone act as a different surround sound speaker, with the master unit in charge of which songs to play. For games, the feature gives you and a friend the chance to go head-to-head against each other, though this isn't anything we haven't seen already.

Since GS 4 units are a bit of a rarity these days, we didn't get to test this particular feature much aside from a few minutes when we first received our device at a press briefing. During that experience, everything functioned exactly as advertised and we had no trouble sharing music. Given that you probably won't have a lot of friends picking up GS 4 units right away, Group Play is a difficult feature to recommend; once the flood of excited consumers start pouring in — not to mention devices like the Note III that seem like locks to receive the service when it launches — it will become infinitely more functional. Until that happens, however, it's no better than vaporware.

The next "smart" feature Samsung boasts on the GS 4 is Smart Pause. The phone pauses the video or movie you're watching any time your eyes look away from the screen. This is another feature that doesn't appear to be universal: it worked well in the pre-loaded YouTube

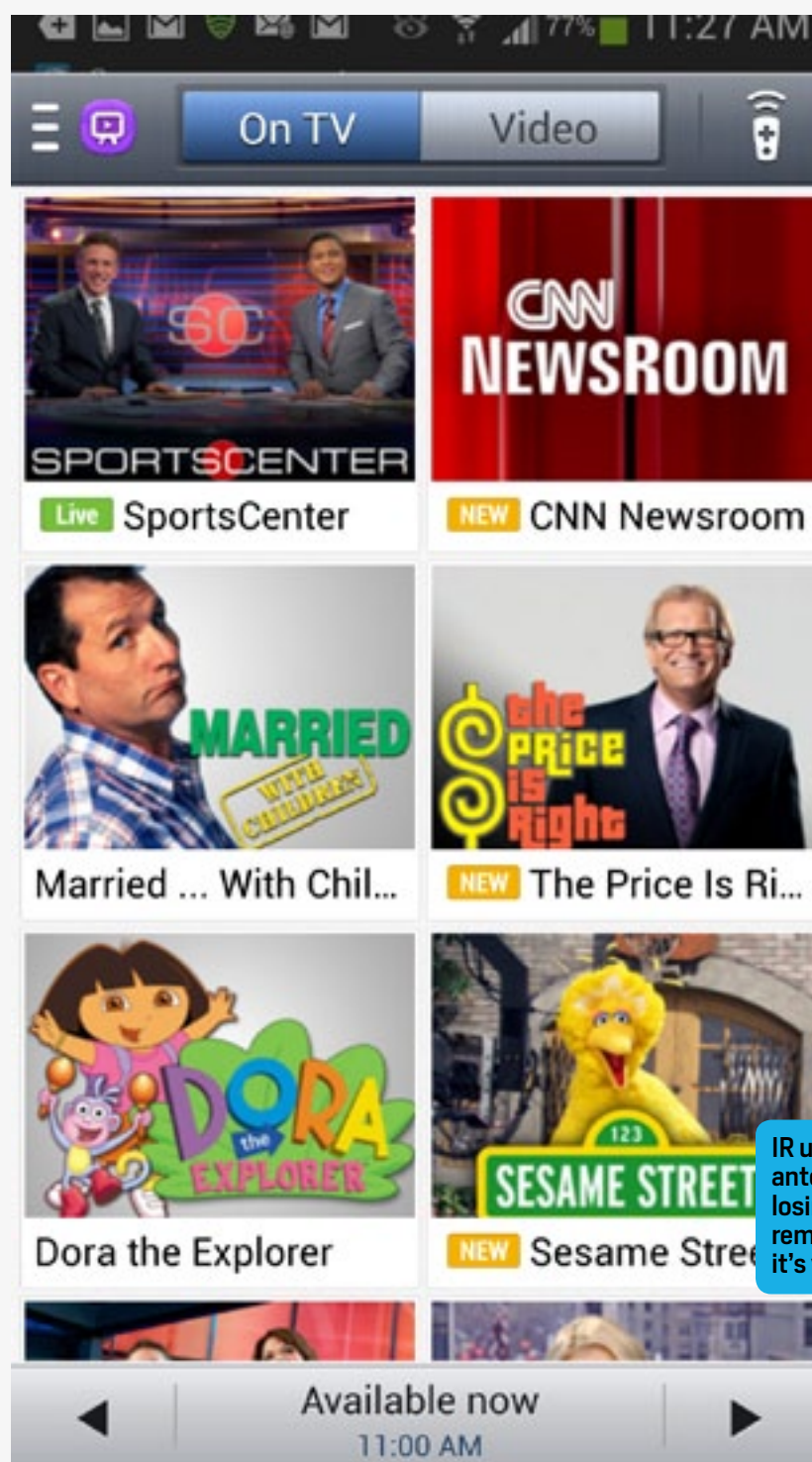
and Samsung Video apps, but it didn't register in Play Movies and third-party players downloaded from the Play Store. This feature performed fine in regular light, but if you want to (or have to) watch a full-length movie in the dark — you know, the preferred setting for watching movies — it's probably not going to work out so well. Of course, we aren't smitten by the idea of having the video stop anytime we close our eyes or briefly take our gaze away from the screen, so it's nice that the feature is turned off by default.

Lastly, an app called S Translator could be the most useful of the bunch. Speak a phrase in one language and the phone is able to translate it and rattle off the translated phrase in a completely different language. If the app is having trouble understanding what you're saying, you can choose to type it in text to get the same outcome. If that doesn't work either, the program has a large library of preset phrases already stored. Pick the category you're interested in — say, you need to get to the airport — and the app can teach you how to ask for a taxi (or you can just have it do the asking for you, if you're lazy that's your preferred style). Have a specific question or phrase you ask a lot throughout your travels? Why go through the trouble of learning it when you can just favorite it for quick access later?

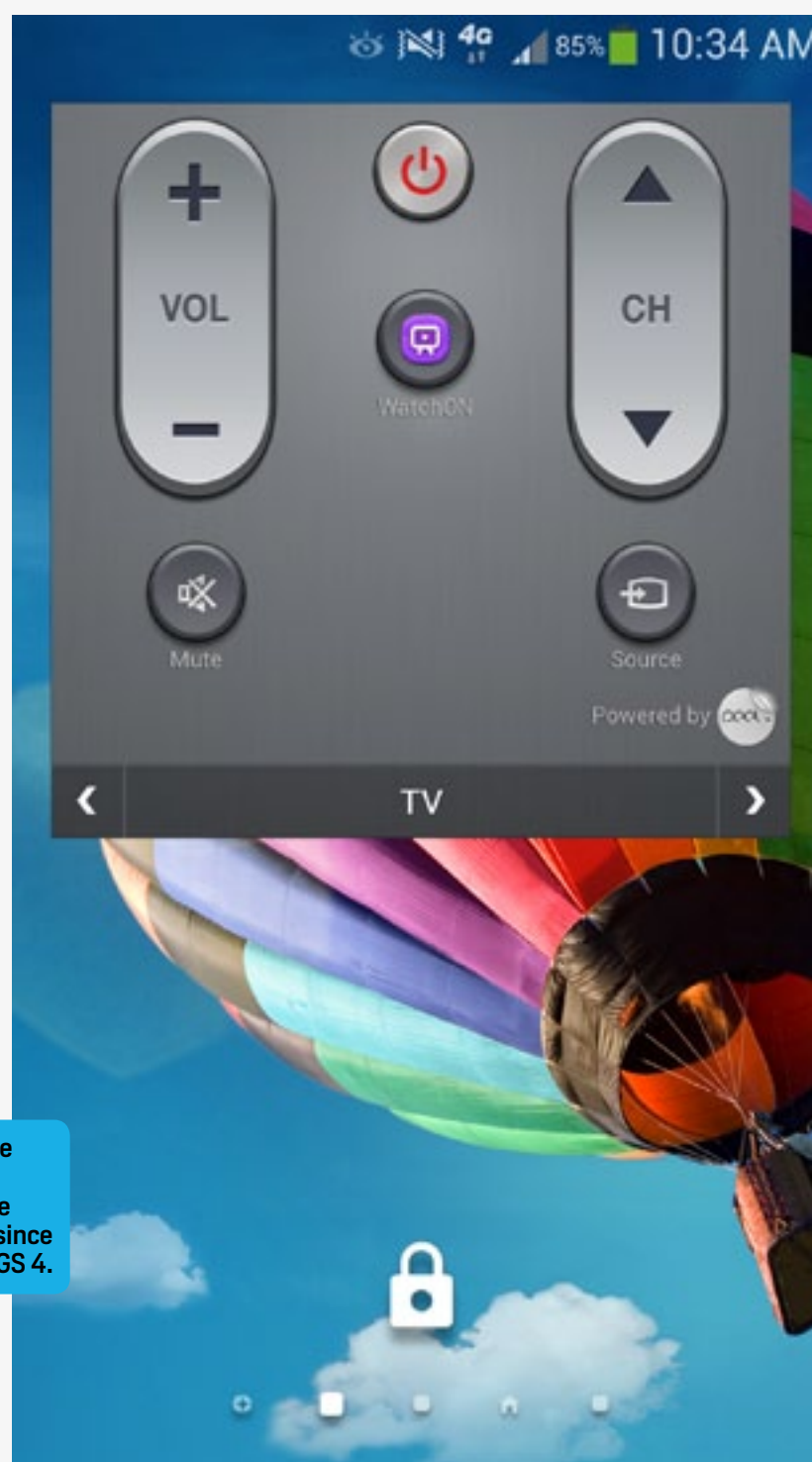
OTHER NOTABLE FEATURES

We're not done yet: there are still a few





IR ups the ante for losing the remote, since it's your GS 4.



more special features worth highlighting. Infrared appears to be making a huge comeback, and the included transmitter found in the top of the GS 4 transforms the smartphone into a remote control. The HTC One and LG Optimus G Pro do the same thing, and just like the former, Samsung is partnering with Peel — not a huge surprise, as the two companies have teamed up before on products like the Galaxy Tab 7.7. The app they've created is WatchON, which acts as a universal

remote, entertainment guide and Netflix portal all wrapped up into one. Those last two features will vary in usefulness depending on cable provider and equipment (hint: Netflix doesn't seem to do much good if you don't have Google TV). We were able to use the remote function to connect to multiple entertainment systems without our fingers breaking into a sweat; in fact, we got a family member's system set up and working faster than it would've taken us to figure out their



Safety Assistance may be one of the cleverest features on the GS 4, but the US models won't offer it.

own mess of remotes.

We'll make brief mention of the next feature purely on account of its cleverness, despite the fact that it won't be available in any US models at launch (meaning, we couldn't test it). The app we're referring to is called Safety Assistance, a tool that you can break out if you find yourself in an emergency and need to broadcast your whereabouts (without using GPS, of course). Activating the service, which is done by holding down volume up and down for three seconds, will prompt the phone to take a picture from both cameras and automatically send them to a pre-determined contact. This will allow that person to see exactly where you're at. Hopefully it'll never have to be used, but something like this should be included on a large number of phones.

The Galaxy S 4 has another unique capability that we've yet to see elsewhere: compatibility with Mobeam. Never heard of it? No sweat. The startup makes it possible for any standard bar code scanner — grocery stores are the most popular examples, but this could extend to any scenario — to scan digital coupons stored on your smart-

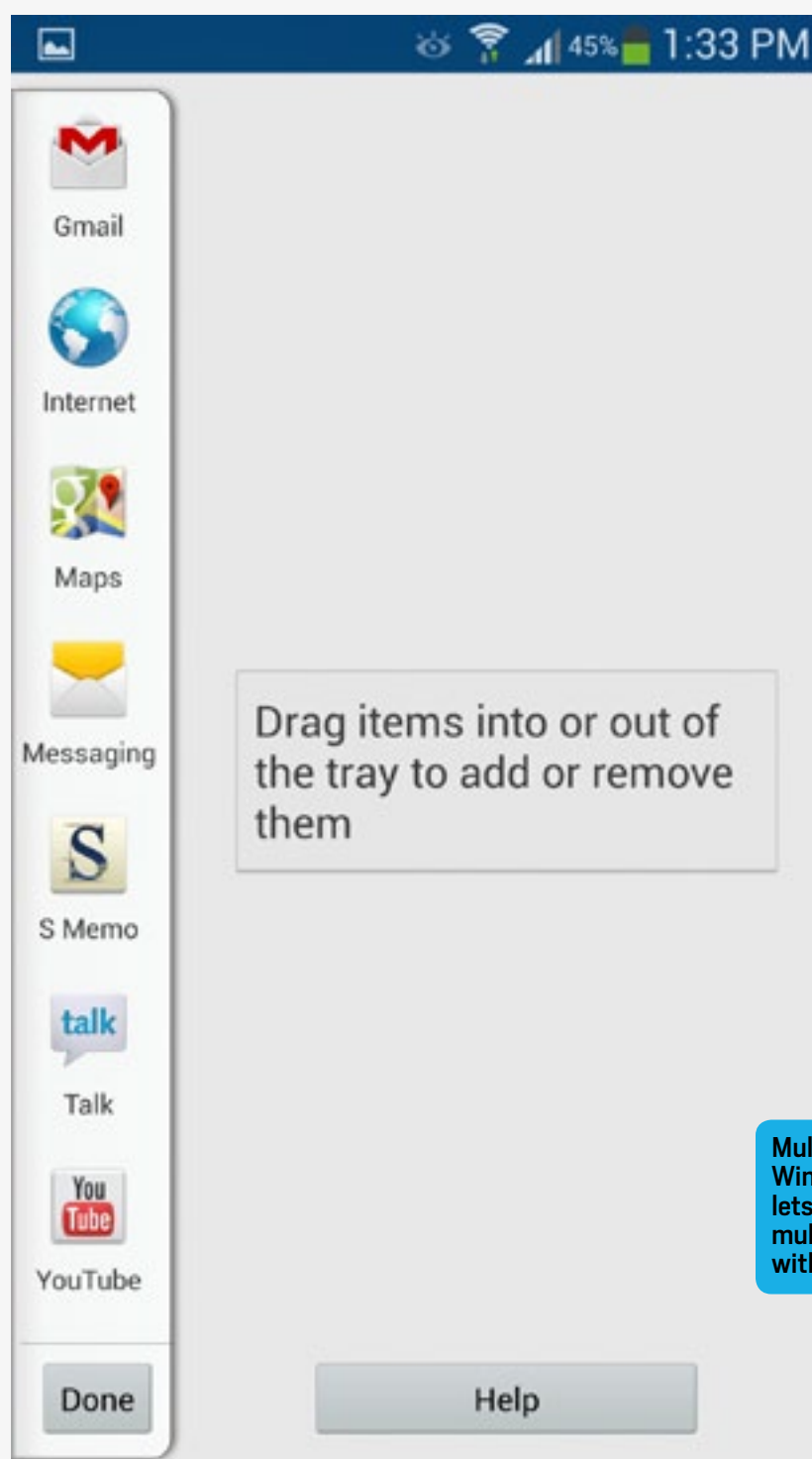
phone. How is this done? It utilizes the proximity sensor built into the handset to bounce light into the scanner, mimicking the pattern of your coupon in the process. It's quite possible that we'll begin seeing this capability show up in more new devices (legacy phones can't be programmed with this feature), but the GS 4 is the first to offer this particular functionality.

Finally, the GS 4 includes a pair of features called Adapt Display and Adapt Sound which function exactly as the names imply: Display is a fancy auto-brightness tool that figures out what you're viewing, as well as the environment you're in, and adjusts the screen brightness to fit your needs. Naturally, Adapt Sound is the audio equivalent of this feature and is capable of adjusting your music or audiobook volume as you change songs or videos, making the sound consistently optimized to your preferences.

LOOK MA, NO S PEN!

One of the unique aspects of Samsung's Galaxy Note series is the S Pen, a stylus-like device that gives you new ways to interact with the screen. Thanks to the GS 4's ultra-sensitive display, however, S Pen features are beginning to trickle down to more devices without actually needing to use the pen at all. The best example of this is Air View, which does many of the same things already accomplished on the Note 2, but with your finger acting as the S





Pen. Hold one of your digits above the calendar to get a pop-up screen of the day's appointments, above your emails to see the first few lines of text (Gmail not included, sadly), above the browser to make the text larger and above the progress bar when watching movies to preview a scene.

Samsung's been adding fancy gesture- and motion-based tricks to its flagships for several years now, thanks to the large array of sensors made avail-

able to Android devices. In the case of the GS 4, the company has incorporated a set of features called Air Gesture.

We first saw a glimpse of this in the Note 2 with Quick Glance, but it's been greatly expanded this time around. Air Jump lets you do page-up and page-down scrolls by waving your hand up or down, while Air Browse will switch you from one browser tab to another when you wave your hand from side to side. And Air Move helps you relocate icons (namely, apps and calendar appointments) to other pages by holding them with one finger and waving your free hand left or right.

Finally, one last feature that's gained popularity in the Note series is Multi Window, and it's fully functional in the GS 4. Press and hold the back button and a tab will magically appear. Tap on it to behold a sidebar of apps that support the feature. Since third-party developers have been doing an amazing job of hopping on board, plenty of applications are already compatible.

CAMERA

Samsung has been mass-producing 8-megapixel camera modules for its flagships ever since the Galaxy S 2, so it almost comes as a shock that the company is ready to push ahead with a 13-megapixel model. As our experience with the HTC One confirmed, megapixel count does not a great camera make, but it certainly can't hurt (in theory).

Multi Window lets you multitask with ease.



And let's face it: potential buyers are more likely to see 13 megapixels as favorable to Samsung's previous 8-megapixel modules — especially when you compare it to the One's 4-megapixel count, Ultrapixels or not.

Additionally, the GS 4 rear camera lens uses an f/2.2 aperture, 4.235mm focal length and a 69-degree angular field of view; the 1/3.06-inch sensor offers a pixel size of 1.12 microns (compared to 2.0 microns on the One). Its 13-megapixel resolution is set at an aspect ratio of 4:3, so 16:9 fans will need to go down to 9.6 megapixels for a widescreen option. On paper, the specs indicate a pretty solid setup for a flagship, but performance doesn't always match up with the specs — especially now that we've used the One extensively and found it to be a bar-raiser in terms of its low-light results.

Samsung took one step forward and one step back with its camera UI. Mainstream users won't have any problem adjusting to the interface, a lot of which has been carried over from the Galaxy Camera: it consists of dual shutter buttons (one for stills and one for video, just like HTC's Sense UI),

gallery access above them and a button underneath that lets you choose from nine different modes, most of which we'll discuss in more detail shortly. Where it regresses from previous phones, however, is in the confusing settings menu, which is found on the top-left corner of the viewfinder. Press it once and you have a small list of shortcut options, as well as another gear icon indicating you have more settings to pick from (you can also access this menu a little more easily by hitting the menu key from the main viewfinder).

Some camera modes also include a downward arrow near the bottom of the viewfinder that features even more options to choose from. Since these menus are different with each corresponding mode — and absent in some modes alto-

The GS3's 8MP camera was bumped up to 13MP for the GS 4.



gether — it may take some getting used to. Speaking of which, let's dive into the new features Samsung has cooked up for the GS 4.

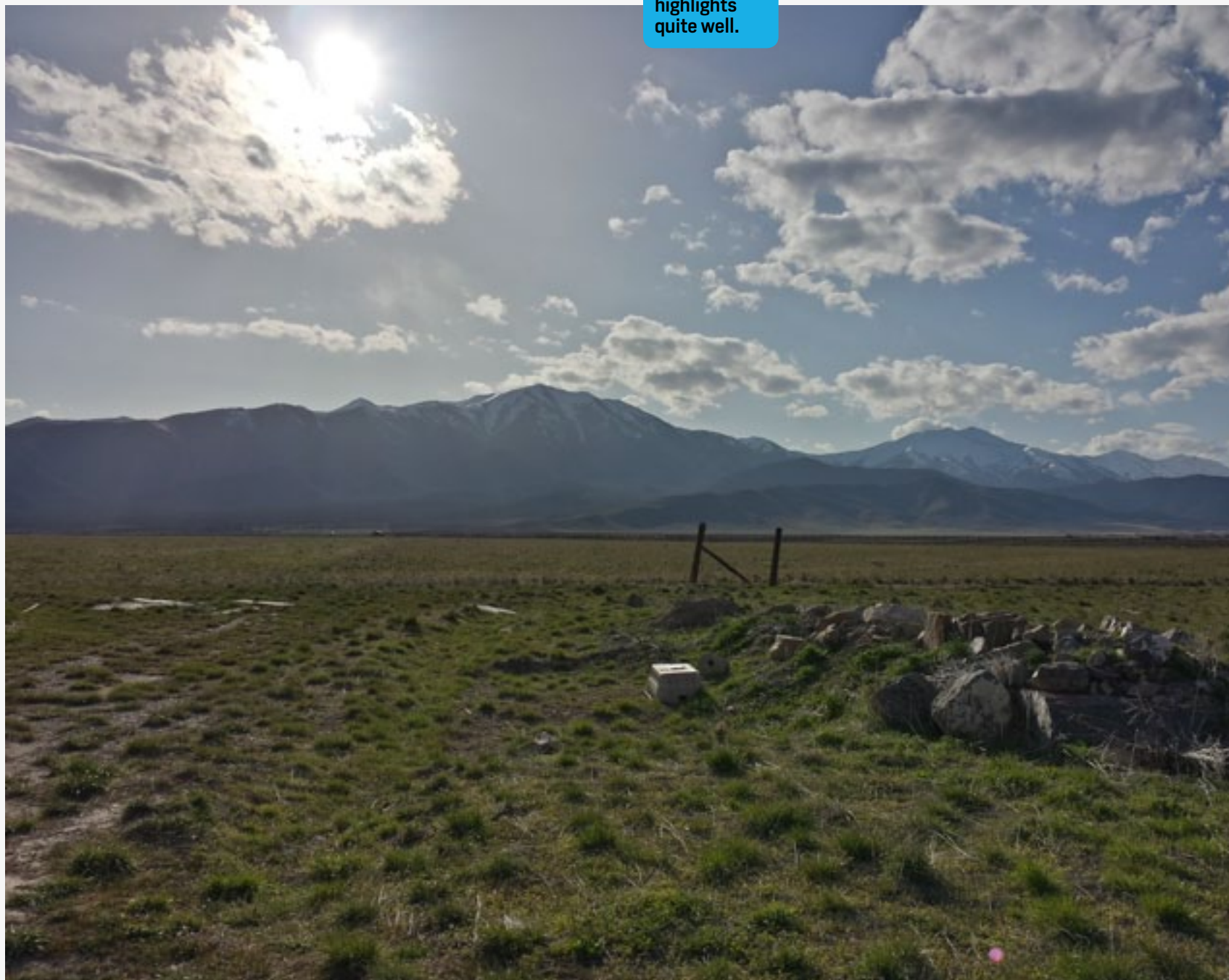
NEW CAMERA MODES

As you can see, Samsung has built a reputation for offering a wide variety of lavish settings that give you an opportunity to tweak your images in a plethora of ways. With the GS 4, it's actually expanding its efforts even more, as several new camera modes have been added to the mix. Many of them are great

for showing off at parties with little usefulness elsewhere, but we found ourselves using a few of them on a more regular basis. We'll discuss each one in order of importance.

Dual-shot takes advantage of both cameras on the phone simultaneously. You now have the opportunity to shoot pictures or videos with the front and rear cameras at the same exact time, effectively creating a picture-in-picture effect similar to what we've already seen on the Optimus G Pro, as well as many televisions.

Rich Tone balances out shadows and highlights quite well.



The smaller frame — which is the front camera view by default, though you can switch views easily at any time — is resizable, can be moved to any part of the viewfinder and can take the form of a box, heart, stamp or *Wizard of Oz*-style floating cloud, amongst others. The GS 4 even lets you do a split-screen effect, with half of the screen showing the front and the other half displaying the back. We know it's gimmicky, but it's one of our favorite features and we imagine plenty of people will find good use for it.

The GS 4 also offers what we like to call “photobomb mode,” officially known as Eraser. It takes a series of images for five seconds and gives you the ability to remove any objects that are moving in the background. Sound familiar? That's because it does exactly the same thing as Scalado Remove — heck, we wouldn't be the least bit surprised if Samsung partnered with the company to make it happen. Regardless, this is a useful feature, but there are a couple drawbacks. First, you have to actually be in

The low-light setting worked well, but didn't best the One.



this mode for it to work; if you're in the standard camera mode and a photo-bomber decides to ruin your kids' only picture with Goofy at the happiest place on Earth, you're out of luck. Second, it occasionally acts finicky, which means that it doesn't always pick up every moving object.

Sound and Shot is a spiffy feature to show off to your friends, but we found no use for it otherwise. In this mode, the phone takes the picture and then records nine seconds of audio immediately following it; then, that recording will play back any time you view the image. The point of this is to capture memories of the event as it unfolds, but we had a difficult time figuring out many good use case scenarios for it.

Then there's Drama Shot, which also seems to have been designed specifically to bedazzle onlookers. It takes a series of burst shots — ideally of a subject that's moving from one side of the viewfinder to the other — and combines them into one image. Think of those old-fashioned "action shots" of sports stars like Michael Jordan going up for a slam dunk, and you'll get the idea. In fact, those frankly are the best use cas-

es for this particular feature.

The last mode we'll discuss is Animated Photo. With this, the camera takes a five-second video clip and lets you decide which parts of the screen to freeze and which ones to animate. You can choose to have the end result go in a forward or backward loop, or go crazy and have the clip go back and forth. In other words, this is your chance to make a really fancy GIF and have certain sections of the screen frozen in time. Something you'd use regularly? Probably not. A cool feature to have? Absolutely. If we're being honest, we had difficulty making anything look particularly artistic, but it's fun to try, at least. Sadly, though, there appears to be no way to go back and redo your masterpiece after it's been saved.

On top of this list of unique camera modes, the GS 4 also offers HDR, Beauty Face, Best Face, Best Photo, Panorama, Sports and Night modes. Most of the scene modes we were accustomed to seeing in older Samsung phones are no longer present — the autumn colors, backlight, candlelight, sunset and several others are now incorporated into the camera's auto mode, which means it's smart enough to select the best scene based on each individual situation.

Most of Samsung's new camera modes are fun to use a few times, but offer little practical use.

CAMERA PERFORMANCE

We've covered Samsung's fancy feast of features ad nauseam, but as any photographer can attest to, those kinds of things don't guarantee high-quality and





Drama Shot offers a new way to capture the action.

great-looking images. But on the GS 4, can you have your cake and eat it too? Are its snazzy modes and settings compensating for a greater problem, or do they simply complement a solid imaging module?

Fortunately, it appears to be option number two, though performance still isn't perfect. Let's get the bad out of the way: although Samsung advertises zero shutter lag, this only applies to objects that are already in focus. We had difficulty capturing moving objects (children, for instance) without those shots coming out blurry; we didn't experience this quite as frequently on the One.

One of the most important aspects of having a 13-megapixel camera is the amount of detail it's capable of capturing, and the GS 4 appears to grab just a little more of it than the same images taken by the One or the GS3. But the extra pixels do their best work when the shots are zoomed in; not only can the GS 4 zoom in further than the One and GS3, it also allows for more cropping and presents more definition than the other aforementioned devices. Color reproduction is slightly oversaturated; dynamic range is noticeably better; and the images aren't as oversharpened as the One.



The camera is very impressive in daylight use, but the One still wins in low-light performance.

When it comes to daylight imagery, Samsung's latest and greatest is pretty impressive, and bests the HTC One, which has been our favorite shooter on an Android device so far and still offers superb colors and natural light.

There's one missing puzzle piece, however, and that's low-light performance. Can Samsung's newest flagship hold a candle to a device that doesn't actually *need* any candles to pick up light? The good news is that the GS 4 is better in this regard than any Samsung phone camera we've seen before, but it still can't outdo the One. In fact, HTC's Ultra-pixel sensor picks up more errant light in its standard setting than the GS 4 does in dedicated Night mode. That said, we noticed that the GS 4 does a better job with what little amount of light it can grab, using its higher resolution to smooth out noise. Lastly, despite the fact that the One has an amazing LED flash, the GS 4's is even brighter.

Video is captured at a maximum resolution of 1080p at 30 fps, and offers a bit rate of 17 Mbps. It's not a terrible camcorder replacement, but there's nothing about it that really stands out either. Ultimately, it's just

your run-of-the-mill phone video capture. That said, the mic picked up excellent audio while filtering out most of the wind and other unwanted noise. The GS 4 also has a stabilization feature that, much like you would see in post-production software, trims off the outer edges of the viewfinder, so those of you with shaky hands (this includes us, too) should consider at least giving it a chance. You'll also be able to play with fast-motion (2, 4 and 8x) and slow-motion (1/2, 1/4 and 1/8) settings for quality entertainment purposes.

If the endless buffet of fabulous camera features isn't enough of an indication, we'll clue you in: Samsung's no stranger to imagery extravagance, especially when it comes to producing the actual masterpiece. The exception to this rule, however, is in its post-production features. Aside from the usual set of editing tools, Sammy hasn't done much to stand out from the crowd. As a method of changing that, the GS 4 comes with a new app called Story Album, which is a lovechild of a partnership Samsung created with self-publishing outfit Blurb. The service does exactly what the name implies; in short, you bundle a bunch of pictures together, create a photo album out of them and then use your phone to order a physical, professional-style version of that collection — whether it be in hardcover, softcover or magazine format. Pick one of five layout designs, add your own captions and select which images



you want to include in the album. Blurb claims that these photo books will be offered in up to 75 countries, so pricing may vary — in the US, you're looking at a minimum of \$9 for a 20-page, 5 x 5-inch book. We enjoyed slapping together a bunch of albums, though sadly we haven't had enough time to order one yet.

PERFORMANCE AND BATTERY LIFE

Generally speaking, flagships feature the latest and greatest components available at the time of their release. As you may have guessed, the Galaxy S 4 continues that tradition, as evidenced by both everyday performance and synthetic benchmarks. This particular smartphone comes in two distinct flavors: one that uses a 1.9GHz Qualcomm Snapdragon 600 chipset and one that debuts Samsung's octa-core Exynos 5 chip clocked at 1.6GHz, the latter of which takes four Cortex-A15 processors and pairs them up with four A7s. Despite the fact that the Exynos chip offers LTE compatibility in all 20 frequencies, the US carriers have all gone with the Snapdragon model.

As a result, our conclusions on the phone's performance are based on tests with the Snapdragon 600, which is paired with an Adreno 320 GPU and 2GB RAM. This is the same chip the HTC One and LG Optimus G Pro use, though the GS 4 is clocked at a faster speed than both of them. The CPU features Krait 300 — a bump from the S4

Pro's Krait 200, which results in a 15 percent improvement in instructions per clock (IPC) and a "speed-enhanced" Adreno 320 GPU. The 600 is also built using a 28nm process, just like the S4 Pro, and offers 802.11ac support (in addition to the standard suite of a/b/g/n). How does it hold up against the One, and what kind of improvement does the GS 4 have over the GS3 (besides an unnecessary space in its name)? Although it's only been one year since the Galaxy S III was launched, the smartphone industry has been the proud recipient of some hefty improvements in processing power — and it's not over yet. The once-dominating force of a Snapdragon S4 chipset is now eclipsed by the Snapdragon 600, and we have a feeling history will repeat itself later this year as soon as the 800 is unleashed into the world. Think about it: out of the six benchmarks we tested, the GS 4 managed to set records in five of them, with the One (the previous record-breaker) not too far behind.

In our review of the HTC One, we witnessed one of the most powerful smartphones we've ever used — and since it uses the same chipset clocked at a higher frequency, the Galaxy S 4 is in similar territory. In general, the GS 4 performs amazingly well, but there's a catch: when

The GS 4 holds the record in five of our six benchmark tests.



SPECIFICATIONS	SAMSUNG GALAXY S 4
DIMENSIONS	136.6 X 69.8 X 7.9MM (5.38 X 2.75 X 0.31 INCHES)
WEIGHT	4.59 OZ. (130G)
SCREEN SIZE	5.0 INCHES
SCREEN RESOLUTION	1,920 X 1,080 (441 PPI)
SCREEN TYPE	FULL HD SUPER AMOLED
BATTERY	2,600mAh LI-POLYMER (REMOVABLE)
INTERNAL STORAGE	16 OR 32GB
EXTERNAL STORAGE	MICROSDXC (UP TO 64GB)
REAR CAMERA	13MP, BSI
FRONT-FACING CAM	2.0MP, BSI
VIDEO CAPTURE	1080P / 30 FPS (REAR); 1080P (FRONT)
NFC	YES
RADIOS	VARIES BY REGION AND OPERATOR
BLUETOOTH	V4.0 LE
SOC	QUALCOMM SNAPDRAGON 600
CPU	1.9GHZ QUAD-CORE
GPU	ADRENO 320
RAM	2GB
ENTERTAINMENT	MHL 2.0, IR TRANSCEIVER, DLNA, WIFI DIRECT
WIFI	DUAL-BAND, 802.11A/AC/B/G/N
WIRELESS CHARGING	NO
OPERATING SYSTEM	ANDROID 4.2.2 (TOUCHWIZ)

Air View and Air Gestures were enabled, we noticed the phone acting a little sluggish even in the most basic of tasks. It would complete those tasks every time, but we couldn't help but notice some stuttering. This seems to indicate that Sammy's razzle-dazzle features are processor hogs and aren't worth enabling unless you use them on a frequent basis (as unlikely as that may seem). On the gaming side, the Adreno 320 works just as well here as it did on the One; while GLBenchmark ranks the GS 4 higher, you likely won't be able to tell a large difference when playing more graphic-intense titles like *Riptide* or *Asphalt 7*.

Samsung's bumped its battery capacity to 2,600mAh (up from 2,100mAh on the GS3), but its more elaborate componentry (higher-res screen, better camera and more powerful processor) tend to suck down more energy. With this balance in mind, we weren't surprised to find that battery life measured by our rundown test (video looping with 50 percent brightness and other standardized settings) was only marginally better. All told, it made it through one complete cycle in nine hours and 15 minutes. If we're comparing T-Mobile versions, this means the GS 4 bested the GS3 by 17 minutes. This is also above average for an early-2013 flagship phone; since we're in the habit of comparing to HTC's pride and joy, the One snagged six and a half hours on the same test. In full disclosure, we weren't able to test out the GS 4 in an LTE area, though the phone had a full



HSPA+ signal. As for real life, we typically got around 14 or 15 hours of regular usage before it was time to recharge. This means that power users should be able to make it through a full workday with a little extra to spare for the commute, and nearly everyone else will likely get pretty close to bedtime before the phone gets in the red.

When we used the GS 4 for making calls, the volume was loud, though still slightly quieter than on the One and iPhone 5. We could hear the person on the other end fine, and they in turn couldn't tell when we were walking down a busy street, thanks to the phone's noise-cancellation capabilities. The external speakers used are louder than the GS3, but not as loud as the One's BoomSound stereo offerings.

When a device has several variants, network performance is tricky to define, at least with one review unit. Samsung

On a full day of regular use, the GS 4 managed to last for around 14-15 hours.

offers up to six possible sets of radio frequencies, so it's ultimately up to individual operators to decide which one works best for their network. For example, T-Mobile and AT&T both have quad-band LTE (bands 2, 4, 5 and 17) and quad-band GSM / EDGE, but T-Mo offers 850 / AWS / 1900 / 2100 DC-HSPA+ up to 42 Mbps while AT&T's HSPA+ bands cover 850 / 1900 / 2100. (As an aside, T-Mobile confirmed to us that its LTE antenna operates with 5-20MHz bandwidth.) Verizon and Sprint both use 850 / 1900 CDMA / EVDO as well as 850 / 1900 GSM / EDGE / UMTS / HSPA+, though Big Red's option offers LTE in bands 4 and 13 (700

BENCHMARK	SAMSUNG GALAXY S 4	HTC ONE	SAMSUNG GALAXY S III
QUADRANT 2.0	12,684	12,495	5,875
VELLAMO 2.0	1,903	2,429	1,626
ANTUTU 3.X	26,143	25,140	10,944
SUNSPIDER 0.9.1 (MS)	772	991	1,194
GLBENCHMARK EGYPT 2.5 HD OFFSCREEN (FPS)	39	34	15
CF-BENCH	28,111	25,140	12,922

SUNSPIDER: LOWER SCORES ARE BETTER. SAMSUNG GALAXY S III WAS BENCHMARKED ON ANDROID 4.1.





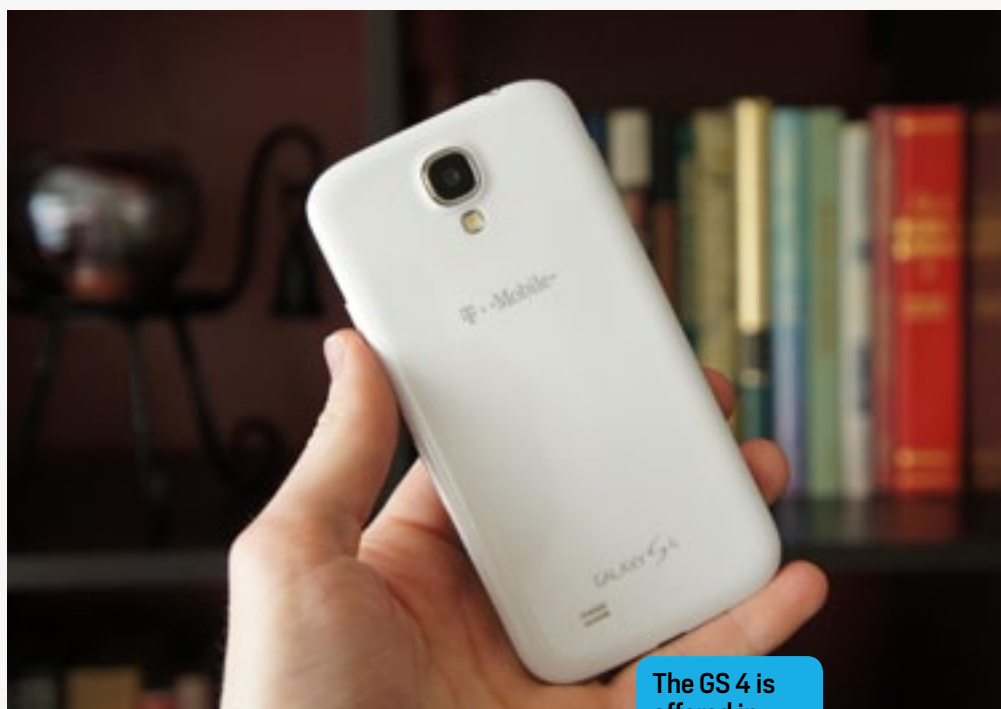
The mono speaker sits at the bottom rear of the phone.

/ AWS) while Sprint uses band 25 (1900). The Now Network uses a removable SIM and will unlock global GSM roaming after the first 90 days of service; we expect Verizon to offer international roaming as well, but we've yet to receive confirmation. The mainstream global models, the Snapdragon 600-powered I9505 and Exynos-powered I9500, offer quad-band GSM / EDGE, quad-band HSPA+ (850 / 900 / 1900 / 2100) and up to six LTE bands. All of this is a long way of saying that data performance will vary depending on which particular model you use, although our T-Mobile unit got speeds that were in line with the GS3 and other comparable flagship phones using the same network.

WRAP-UP

In drawing our conclusion of the Samsung Galaxy S 4, we find ourselves at an interesting junction: while our geek senses keep tingling at the thought of so many market-topping specs contained within the same chassis, we also aren't *overjoyed*, per se, with excitement. The design doesn't feel fresh, especially not next to the HTC One, but we can't deny that it's an improvement over the GS3. On the plus side, it has better battery life, the same smooth performance and a beautiful display, and a few diehards will like its inclusion of microSDXC and a removable battery cell. Software-wise, Samsung's brand-new features are innovative and clever, yet most of them don't solve any






The GS 4 is offered in Black Mist and Frost White.

actual UX problems; they seem impractical and are (in some cases) less convenient than tried-and-true methods we've used in the past.

If you're considering a move from an older Samsung device, the GS 4 is absolutely the handset you want. Your learning curve will be minimal thanks

to TouchWiz's consistent UI, and besides, it's generally a great smartphone — heck, the phone itself is the best Samsung handset we've used to date, and it'll definitely give the One a run for its money. All told, both phones have different strengths and weaknesses, so one handset unfortunately won't fit all. But when we compare it to the eye-catching look and feel of

the One, we can't help but think of one word to describe Samsung's particular flagship entry: predictable. 

Brad is a mobile editor at Engadget, an outdoorsy guy, and a lover of eccentric New Wave and electro. Singer and beatboxer.

BOTTOMLINE

SAMSUNG GALAXY S 4

\$ VARIES BY CARRIER



PROS

- Superb 1080p Super AMOLED display
- Camera takes impressive daylight shots
- Snapdragon 600 delivers solid performance
- Battery life better than most flagships

CONS

- Several new features are impractical and half-baked
- Boring overall design without premium look or feel

BOTTOMLINE

The Galaxy S 4 is a solid improvement over the GS3, and the best Samsung device we've ever used, but we'd love to see Samsung come up with a fresh design and premium look.



TechShop



An Industrial Revolution
for \$125 a Month
By Brian Heater





The Square credit card reader is one of the more prominent success stories to come out of TechShop.

Someone, Mark Hatch, if I had to guess, has left a Square reader just to the left of where we've set up our cameras. It's on a table next to a small, but exceptionally diverse array of gadgets. There's a wooden book that unfolds into a desk lamp and a polymer incubation blanket for infants that's "on track to save 100,000 children's lives," according to Hatch, TechShop's spikey-white-haired CEO. But it's the little white plastic



dongle that's the star of this show, through the power of sheer ubiquity, popping up in coffee shops and taxicabs everywhere. Square's modest undertaking has since ballooned to a roughly 300-person operation. The project was born in this very space, eventually moving to a building in San Francisco's SoMa district a block or so away, the mobile payment company having opted not to stray too far from the place where it was first conceived.



Laser-cut casing components and fully assembled Series 1 3D printers made by Type A Machines, an operation based entirely out of TechShop SF.

When it comes to proximity, Square is by no means an anomaly — if anything, the company's strayed a bit away from the pack. TechShop's overseers have, quite cannily, begun to offer up a portion of the warehouse's 17,000 square feet as office space, giving its members a shot at some prime San Francisco real estate, a flight of stairs up from an impressive array of machine tools — laser cutters, waterjets

and more 3D printers than most mortals have seen in one place. "Literally everything you need to make just about



anything on the planet," says Hatch, in typically definitive terms. And while there's arguably still some sense of hyperbole in the notion of the "next industrial revolution" (as 3D-printing evangelist Bre Pettis loves to put it), it's hard to stand here in the well-lit warehouse amongst the buzz of machinery and ideas and not appreciate the sentiment.





Members of TechShop have been using the facility to “build their dreams,” from the practical to the fantastical.

TechShop’s mini-empire of social hackerspaces stands as a testament to the right idea at the right moment. It’s the result of a whole lot of distinct elements congealing into a successful business model, including a membership fee that gains you access to the tools and classes to help you do just about anything yourself. A \$125/month fee gets you access to everything you need to get in on the ground floor of the hardware startup revolution. Inside the warehouse, you’ll find a makeshift salon of students, young professionals, industry veterans and curious hobbyists meeting in the downstairs machining area and upstairs on sunlit benches for makeshift beta testing and freeform workshopping.

Founder Jim Newton, a robotics professor and onetime *MythBusters* science adviser, set up shop at the first Maker Faire in 2006, behind a sign reading, simply, “Tech-



Shop: Build Your Dreams Here.” The 250 showgoers who signed his mailing list formed the basis of the company’s first space, a cobbled-together collection of equipment housed in an industrial building just off the freeway in Silicon Valley-entrenched Menlo Park. The company’s since launched locations in Detroit, Pittsburgh, Raleigh-Durham and Austin, and added an additional two to its Bay Area arsenal, including this San Francisco locale, which has become something of a de facto flagship location for the organization. Locations in Arizona, Brooklyn and Washington, DC, are currently in the planning stages.

Hatch cites any number of factors as contributors to his company’s success, beginning with a dramatic reduction in the price of machining equipment, thanks in no small part to the influence of Japanese and Chinese producers. The phenomenon has led to an astonishing 75 to 85 percent drop in the price of the tools that are so core to the TechShop experience. The introduction of desktop computing has also had a profound effect on that front.

“A lot of these tools are hooked up to computers, so they’re computer-numerically controlled machines,” says Hatch. “And of course that computer and that software

The upper levels of TechShop offer workstations and its recently added private office spaces.





With great power tools comes great responsibility, and safety protocols, protective gear and warning labels.

have followed Moore's law. The CNC mill, 10 to 15 years ago, would've been a quarter-million dollars, and we're now buying this machine for less than \$20,000. What we do is we layer this, you know, membership-based system on top of this. So for \$125 a month — or as I like to say 'for the cost of a coffee addiction' — you now have access to the tools of the industrial revolution."

Then there are all of those elements that have driven the birth of the hardware startup movement. As foreign influence has driven down the price of manufacturing tools, the race for dominance in the commercial mobile space has significantly dropped the pricing and size of mobile components, all while power and availability have skyrocketed. The explosion of commercial 3D printers and microcontrollers means that prototyping is no longer the semi-exclusive domain of larger companies. And, of course, the influence of crowdfunding has offered more than enough incentive for creative tinkerers to fully invest in seeing notebook sketches through to fruition.

"As a result, you create your own job," explains Hatch.



“You create a job for your friend, and your next friend, and pretty soon you need an office.”

While there’s much to be said for the communal nature and exchange of ideas that comes with setting up camp in the kitchen of one’s hackerspace, the time eventually comes for most companies to do business behind closed doors. For TechShop, the answer is quite simple: be the one to build those doors. The company has constructed offices on-site, allowing fully formed companies to exist in the same space as newly realized projects, maintaining access to the impressive array of tools and the TechShop hive mind.

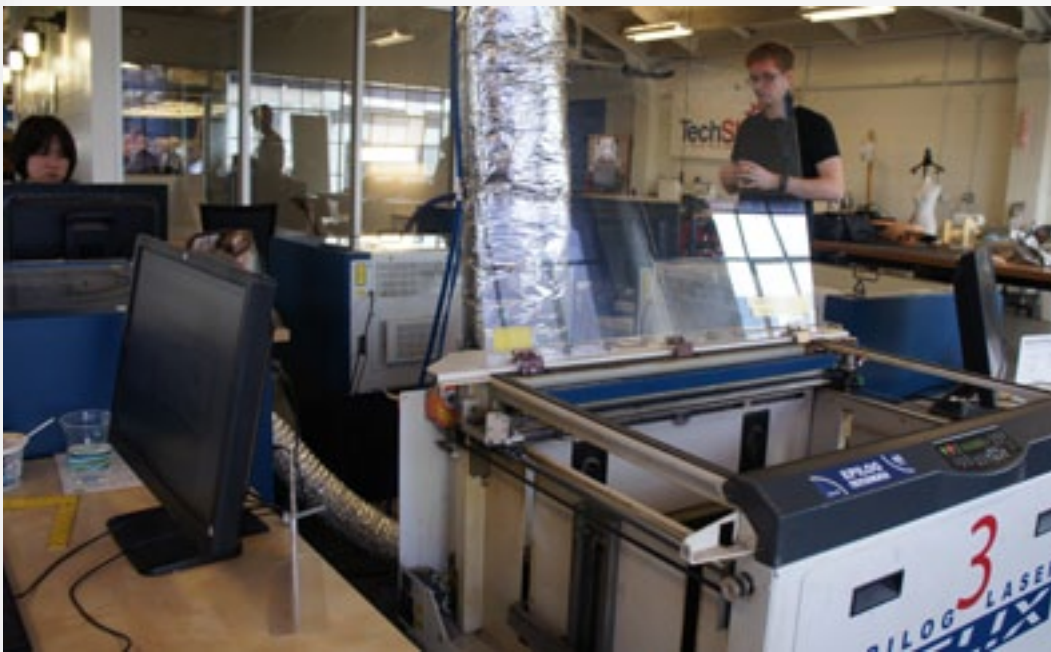
“Part of our design is to have startups actually officing on-site, and they often graduate,” says Hatch. “Then they’ll

move, you know, a couple blocks away like Square. It’s literally a half a block away and they now have something like 300 employees.” Now the place is home to a diverse and fascinating array of companies and organizations like San Francisco Made, a non-profit that, quite fittingly, is focused on promoting local manufacturing.

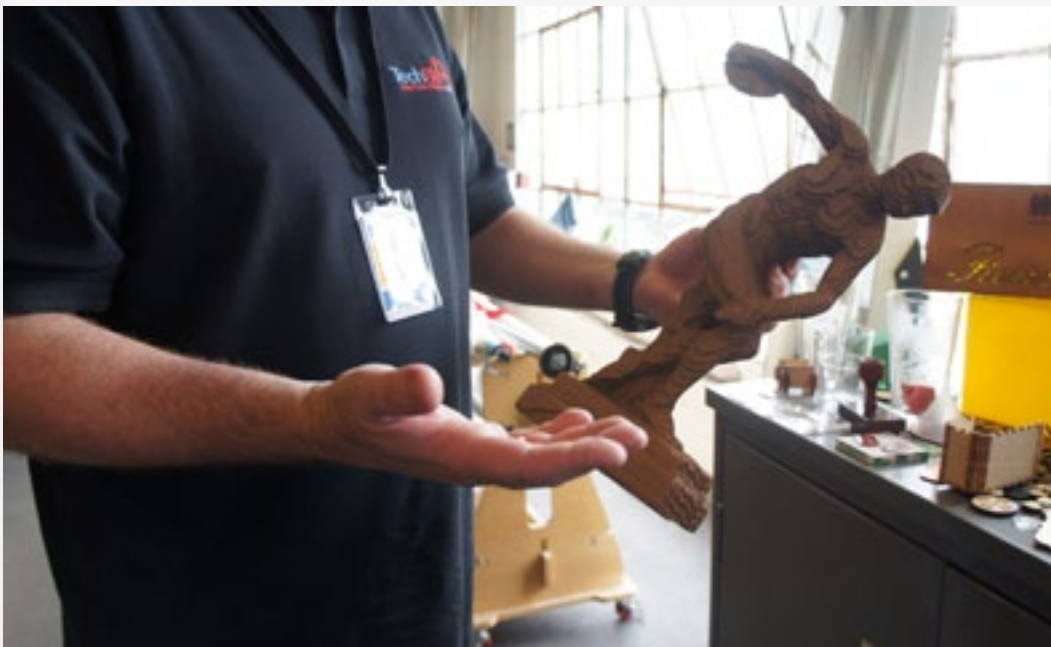
There’s also Type A Machines, a company borne out of the Re-prap 3D open-source 3D-printing revolution.

“All of us are members here,” says CEO Kevin Roney. “We actually base our operations here in an office on the third floor. Type A Machines does its complete production here in San Francisco at TechShop. We use the Tormach [CNC mill] for milling out the hot ends, the waterjet for cutting the fanblade mounts [and] the lasers for cutting the casing.”

It’s quite a thing to behold,

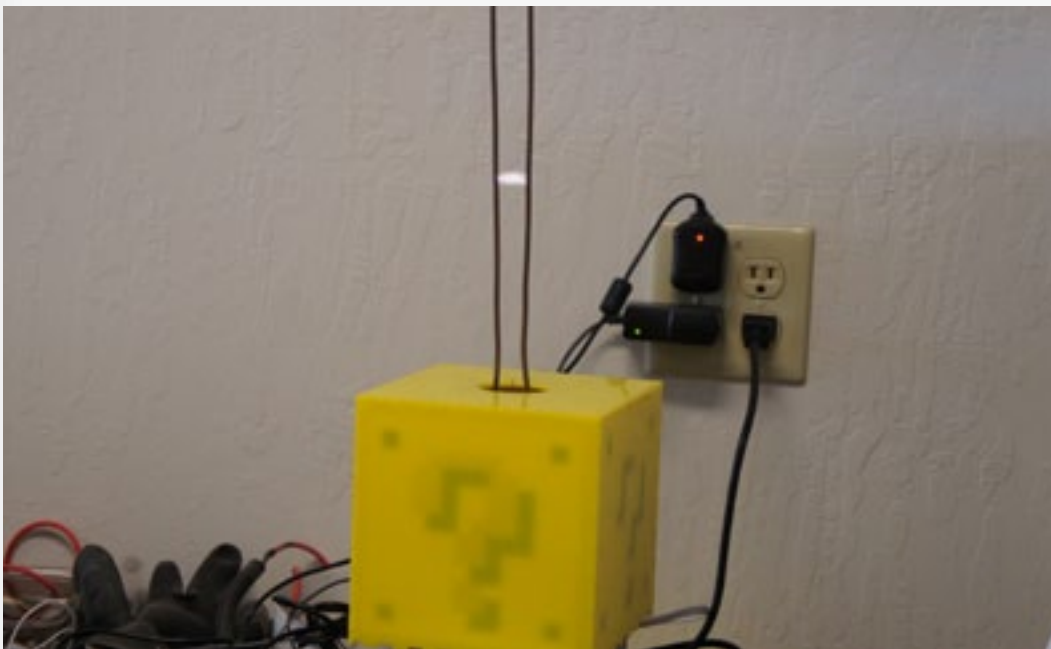


The hackerspace has 3D printers, laser cutters and CNC routers, which are useful in rapid prototyping and creating precision-cut Diskobolus of Myron models.





ProtoTank's founders got their start working together on this *Mario Bros.*-inspired desktop lamp and TechShop was the perfect place for them to realize their ideas.



really: the company's full production line laid out in its small, backroom offices, its Series 1 printers all assembled on-site. It's a small, but powerful reminder of how the hardware revolution may some day turn the tides on the steady loss of manufacturing jobs in this country. It still seems a bit of a pipedream for major manufacturing, but as demand for products becomes more fragmented and niche, it's possible to see an increasingly important role for localized manufacturing.

Located just next door, ProtoTank is more an idea factory than a miniature in-house hardware manufacturer. "We're three guys and one girl who just decided it was way too much fun to build hardware together," explains co-founder Sam Brown. The company started life with the creation of a *Mario Bros.*-inspired desktop lamp, a cube sporting the familiar ques-

tion mark that illuminates with impact. The location of its first office space was a natural fit, given the communal nature that gave rise to the company.

"These are some of the brightest minds I've come across," explains fellow co-founder Adam Ellsworth. "While it's a four-person team, we certainly wouldn't be in the place we are without the community. We can create prototypes and small manufacturing runs with tools it wouldn't be possible to fund ourselves. We couldn't afford a waterjet, and a laser cutter would be a pretty large investment, but being in this building allows us all that."

In amongst all this movement, the US government itself is beginning to take notice of TechShop's goings-on.



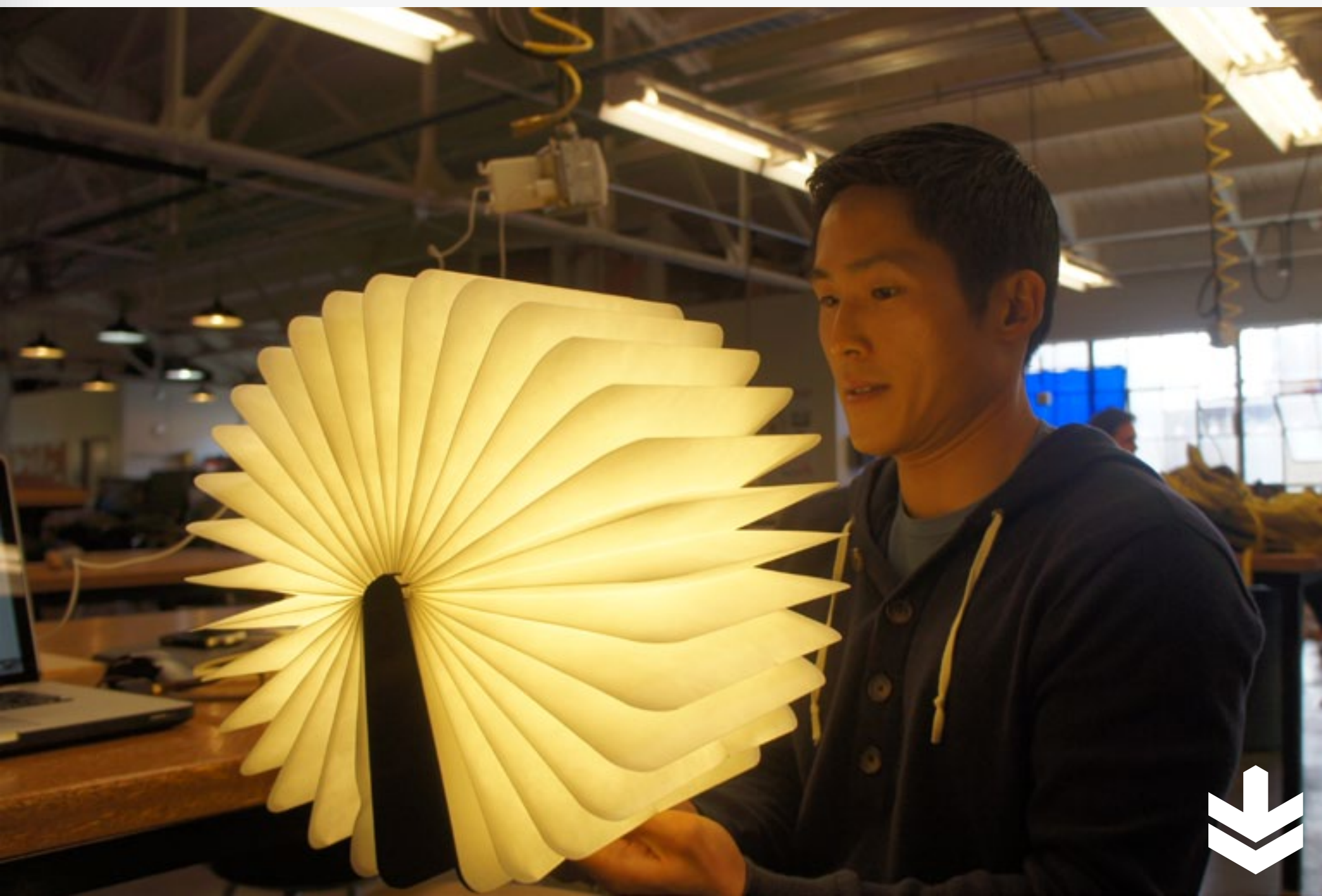
“One of our biggest fans is David Kappos, [former] head of the US Patent and Trademark Office,” says Hatch. “He came to Menlo Park a few years ago and did a presentation to a bunch of inventors, and at the end of it, grabbed our founder, Jim Newton, and said, ‘Hey, we’ve got to work with you guys because this is exactly what we need. We need more inventors in the US, and we need to communicate better on what the provisional patent means and how to go through the patent process and my examiners are really there to help.’”


The solution to improved communication between the two parties is a sort of red Batphone that connects directly to the USPTO hotline, located just to the side of a bank of computer workstations on the second floor.

“We told the commerce department [about the phone],” says Hatch. “They, of course, then told us that we need[ed] to have a green phone that hooks directly to Commerce Connect.”



Designer Max Gunawan developed his Lumio desktop lamp here at TechShop. This battery-powered LED light is housed in a wooden, book-like casing.



It's easy to see why the government would take notice of TechShop. The space is a utopian prototype for the push to foster a more startup-friendly environment in the US. As with the media landscape before it, one can foresee a future when a fair amount of hardware will shift to a hyper-specialized model, with many consumers trading in mass-produced products for limited-run devices targeted toward their individual needs and desires. The smartphone revolution has done wonders for the speed, size and price of components and explosions of programmer-friendly hardware like Arduino boards and desktop 3D printers have made it that much easier to transfer ideas from the drawing board to the real world. If the US government has its way, of course, that manufacturing will be happening right in our backyard. And with the help of crowdfunding sites and desktop prototyping, it just may be TechShop that leads that charge. 

Brian's work has appeared in Spin, The Onion, Entertainment Weekly, The New York Press, PCMag, Laptop, and various other publications.



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PLAYFUL HEDGEHOG PARTICLES



IMAGE COURTESY OF THE MATERIALS RESEARCH SOCIETY (WWW.MRS.ORG) SCIENCE
AS ART COMPETITION AND YUE WANG, UNIVERSITY OF CALIFORNIA, LOS ANGELES.



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VISUALIZED

PLAYFUL HEDGEHOG PARTICLES



The Materials Research Society, an organization promoting research and interdisciplinary information exchange about materials science has announced a winner in its Spring 2013 Science as Art contest. Joong Hwan Bahng of the University of Michigan took first place with this colorized SEM image of “Hedgehog’ particles with nanoscale corrugation, sculpted by interfacial growth of rigid ZnO nanowires on polymeric microspheres.” With such complex terminology it’s easy to see how artwork and colorful Koosh-laden landscapes help to engage everyday people in the wonders of the nanoscale world.

IMAGE COURTESY OF THE MATERIALS RESEARCH SOCIETY (WWW.MRS.ORG) SCIENCE AS ART COMPETITION AND YUE WANG, UNIVERSITY OF CALIFORNIA, LOS ANGELES.



PALMER LUCKEY



THE OCULUS VR FOUNDER and designer talks perception modification and maintaining a meatspace presence

What gadget do you depend on most?
My Galaxy S III.

**Which do you look back upon
most fondly?**

My Nokia N800. Amazing device, so ahead of its time! Video chat, front- and back-facing camera, Flash support, an App store, Linux-based OS, dual SD card slots; that thing was a dream device.

**Which company does the most
to push the industry?**

Google. They have their fingers in a lot of pies, and more often than not, the industry moves forward in those spaces.

**What is your operating system
of choice?**

Windows 7 Ultimate for desktops, stripped-down Windows XP Pro for laptops, Android for mobile devices.

What are your favorite gadget names?

The “OpenPandora” hand-held game console had a sweet name; the idea that it was disrupting the game industry by opening a Pandora’s box of incredible features. Unfortunate that the only thing disrupted was its launch schedule.

What are your least favorite?

The Samsung :). Naming a gadget with an emoticon makes little sense.

Which app do you depend on most?

Google Voice.

**What traits do you most deplore
in a smartphone?**

Capacitive buttons, exaggerated





A rendering of the Oculus Rift VR developer prototype headset.

display specifications and OS skinning.

Which do you most admire?

Physical buttons and expandable storage.

What is your idea of the perfect device?

The perfect device would allow me to experience, capture and modify my perception of and interaction with the world at will. Augmented reality is going to make it possible someday!

What is your earliest gadget memory?

I remember being fascinated by my mother's Motorola StarTAC. At the time, it was the smallest phone on the market, and I got it for myself when she upgraded

several years later.

What technological advancement do you most admire?

Publicly viewable asynchronous communication systems in general. Forums and mailing lists stockpile an incredible amount of information for passive users, and an accessible platform for active users to communicate with the entire world.

Which do you most despise?

Electronic echo chambers. The way that blogging, news and social media systems are built makes it all too easy for people to only interact with media and people that perfectly mesh with their world views and opinions, and block out anything



“Intuitive interfaces make for a good first impression, but a functional interface is much better in the long run.”

that might possibly challenge them.

What fault are you most tolerant of in a gadget?

Steep learning curves. Intuitive interfaces make for a good first impression, but a functional interface is much better in the long run.

Which are you most intolerant of?

Updates and features that are promised, but never come. So many devices add features that barely work to meet the list of bullet points that marketing guys think they need, and then don't get basic software updates.

When has your smartphone been of the most help?

Someone dropped me off in the wrong part of LA by accident one time, and my phone let me safely navigate my way out. Thank you, Google Transit beta!

What device do you covet most?

Sennheiser Orpheus headphones. I

have HD800s, and those are nice, but the Orpheus is just gorgeous. Pity that so few were made!

If you could change one thing about your phone what would it be?

Better battery life. I am very willing to carry a thicker device in exchange for better battery life, and extended battery packs generally waste a lot of space.


What does being connected mean to you?

Connected means that people can get in touch with me whenever they want, and that I can have access to whatever information I need.

When are you least likely to reply to an email?

When I am driving. It boggles my mind that so many people text and email while piloting a high-velocity chunk of steel through populated areas!

When did you last disconnect?

Months ago, before I started Oculus. Being connected is actually not something I do because I want to; it is because I have to. For years, I would keep my phone turned off unless I actively needed to use it. Making yourself constantly available to everyone in your social circle can be exhausting; better that you live in meatspace sometimes! 



IN REAL LIFE is an ongoing feature where we talk about the gadgets, apps and toys we're using in real life.

BLACKMAGIC DESIGN CINEMA CAMERA

BLACKMAGIC DESIGN'S Cinema Camera, like many of the company's products, is an enigma. It fits into no particular market segment, since professionals who'd get the most out of it could afford to spend much more than the \$3,000 list price, while amateur videographers able to drum up the cash might still have no idea what to do with the thing. On top of that, it has huge strengths and glaring weaknesses, giving pause even to those

who can see the inner beauty behind its rather beastly form factor.

One thing is for sure: it takes gorgeous images. Using a variety of EF and EF-S lenses like Canon's EF 50mm f/1.2 and EF-S 15-85mm f/3.5-5.6 IS USM, I was able to create sharp video, completely lacking in the types of moire and aliasing apparent in almost every DSLR — including those costing a similar sum or more. Even shots thick with fine detail like trees and branches



**Bluelounge
Messenger
Bag**



“Operationally, the camera is dead-simple to use, but also dead-manual, with only a few settings to fiddle with...”

rendered perfectly, thanks to the uncompressed 12-bit RAW or lightly compressed 10-bit ProRes files it produced. The camera also outputs “flat” images which look washed out at first glance, but give the best possible results when doing color retouching later in post-production. Operationally, the camera is dead-simple to use, but also dead-manual, with only a few settings to fiddle with like the “shutter angle,” a film term for shutter speed compared to frame rate. The screen itself allows manual focus to be set fairly precisely (thanks in part to a canny focusing option). Unless, of course, you’re outside in the sun, in which case it’s impossible to see and requires a shade or hood.

After that, things start to get a bit muddy. The first hitch is the sensor size, which is even smaller than those on Micro Four Thirds cameras like Panasonic’s GH3. Smaller sensors yield less depth of field (a bummer in and of itself), but my biggest problem was

with the Canon EOS mount on my demo unit. Its small size more than doubles the effective focal length, meaning that an EF 50mm lens becomes a 115mm telephoto, making that glass much more difficult to use for video than it should be. To get a normal focal length, you actually need a flat-out wide-angle 24mm lens — which not only costs much more, but can never be as sharp, or fast, as a standard lens. Luckily BMD’s Micro Four Thirds mount option addresses some of that, but it highlights another big catch to the camera — no autofocus. Filmmakers with on-set focus pullers may not care about that, but the many independent producers who may want, and can easily afford the camera may see that as a dealbreaker.

Despite those faults, it’s hard to take issue with a company that’s managed to produce an incredibly cheap (yes, cheap) camera that makes strikingly cinematic images. None of the criticism leveled at its debut model has dissuaded BMD anyway, as it just announced a new camera at NAB that brings a Super 35mm sensor and 4K resolution for the ridiculously low price of \$4,000. And even with the funkiness of the original, I still want one — which bodes well for the upstart company and its entire camera lineup.

— Steve Dent



BLUELOUNGE MESSENGER BAG



**Blackmagic
Design
Cinema
Camera**

WHAT YOU'RE LOOKING at here is the Bluelounge Rust Messenger Bag, which I acquired fairly recently. It's a \$139 eco-friendly shoulder throw that comfortably houses my 15-inch MacBook Pro, with room enough in the pouches and front flap to stuff a good deal of cables and accessories. The outer material is a rust-colored, weather-resistant canvas made of recycled PET. While I wouldn't recommend wearing it out during a hard rainfall, I've found it does repel a substantial amount of moisture with that Rain-X sort of effect. The design is fitting too: it brandishes sandblasted alumi-

num carabiners and buckles that would make any MacBook feel at home. To me, it's a solid mix of fashion and quality that says, "I could hike the trail" or "I could attend a business meeting." Just not both at the same time.

I was actually a bit wary at first of using a messenger-style haversack, but this one, at least, is seriously comfortable. You won't get that laced, snug fit that you look for in a pair running shoes, but it still holds to the shoulder quite nicely. There's a decent amount of padding in the larger laptop compartment and on the base, though not enough to keep me from consciously using

lighter hands during the dismount. Though it's not particularly suited for bulk and weight, I've been able to cram in my MacBook, a few good-sized textbooks and a bunch of assorted gadgetry without overloading it. It's a win in my book — provided you're willing to shell out \$139 for a bag, anyway.

— Andy Bowen



The week that was in 140 characters or less

Tweet Extension, Ticket Rush and Coffee with Cook

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REHASHED

@_virginia_w

8 years of training, for a one way trip to Mars? I'd totally volunteer, If for no other reason, just so I could Tweet 667 days a year.

@preshit

WWDC 2013
tickets sold out
before I could
make a joke about
WWDC 2013
tickets selling out.

@saschasegan

Doesn't that WWDC
invite look like a
TV screen?
DIDN'T I JUST
BLOW YOUR MIND?

@mbrit

Anyone who could afford to drop \$200k for a coffee with Tim Cook could probably get a meeting with Tim Cook anyway, for free.

@EvanSelleck

So, does Microsoft win by default if they have an Xbox event and show the Xbox?

THE STRIP

BY BOX BROWN



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TIME
MACHINES

WHAT IS THIS?
TOUCH TO FIND OUT



PHOTOGRAPH BY MARK RICHARDS. COURTESY OF THE COMPUTER HISTORY MUSEUM



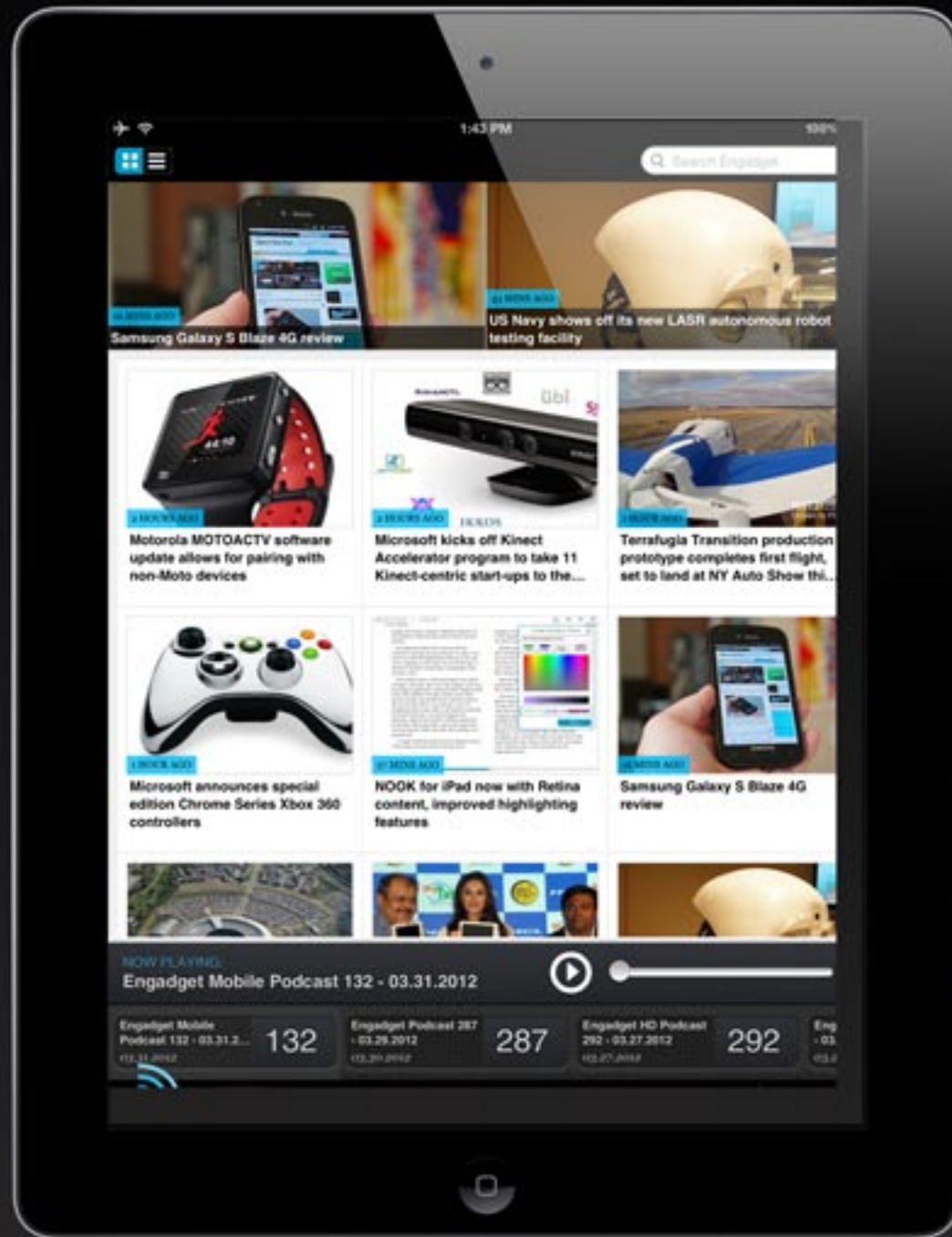
ANDERSON JACOBSON ADC 300



Computers are pretty chatty nowadays, directly exchanging digital data over various networks (often wirelessly), but in the golden days of computing, most of the discussion was done over wired phone lines using an audio signal. Since the '60s, acoustic data couplers have allowed casual users to convert a computer modem's digital data into a sound transmission and back again on the receiving end, offering a then-optimized method for computers to shoot the breeze. Many devices would cradle a telephone handset in twin foam cups to eliminate signal decay; some, like the 1968 ADC 300, had further enclosures to isolate the exchange from outside noise.

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